

CE EMC TEST REPORT

for

DC-DC Converter

Model: PAW/PBW SERIES

Brand : DANUBE

Test Report Number:

80826401-E

Issued For

Danube Enterprise Co., Ltd.

A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814, Taiwan(R.O.C.)

Issued By

Compliance Certification Services Inc.

Tainan Laboratory

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Issued Date: September 15, 2008



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REVISION HISTORY

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		September 15, 2008		Initial Issue	ALL	Leah Peng



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**1 TEST CERTIFICATION****Product:** DC-DC Converter**Model:** PAW/PBW SERIES**Brand:** DANUBE**Applicant:** Danube Enterprise Co., Ltd.A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814,
Taiwan(R.O.C.)**Manufacturer:** Danube Enterprise Co., Ltd.A2, No. 255, Fengren Rd., Renwu Shiang, Kaohsiung County 814,
Taiwan(R.O.C.)**Tested:** August 26, 2008 ~ September 15, 2008**Applicable
Standards:** EN 55022:2006**EN 55024: 1998 + A1: 2001 + A2: 2003**

IEC 61000-4-2:1995+A1:1998+A2:2000

IEC 61000-4-3:2006

IEC 61000-4-4:2004

IEC 61000-4-5:2005

IEC 61000-4-6:2007

IEC 61000-4-8:1993+A1: 2000

Deviation from Applicable Standard

None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:**Jeter Wu**
Section Manager**Reviewed by:****Eric Huang**
Assistant Section Manager

**2 TEST RESULT SUMMARY**

EMISSION			
Standard	Item	Result	Remarks
EN 55022: 2006	Conducted (Main Port)	N/A	No requirement for DC device
	Radiated	PASS	Meet Class B limit
EN 61000-3-2:2006	Harmonic current emissions	N/A	No requirement for DC device
EN 61000-3-3 1995 + A1: 2001 + A2: 2005	Voltage fluctuations & flicker	N/A	No requirement for DC device

IMMUNITY 【 EN 55024:1998 + A1: 2001 + A2: 2003 】			
Standard	Item	Result	Remarks
IEC 61000-4-2:1995+A1:1998+A2:2000	ESD	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-3:2006	RS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-4:2004	EFT	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-5:2005	Surge	PASS	Meets the requirements of Performance Criterion B
IEC 61000-4-6:2007	CS	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-8:1993+A1: 2000	PFMF	PASS	Meets the requirements of Performance Criterion A
IEC 61000-4-11:2004	Voltage dips & voltage variations	N/A	No requirement for DC device

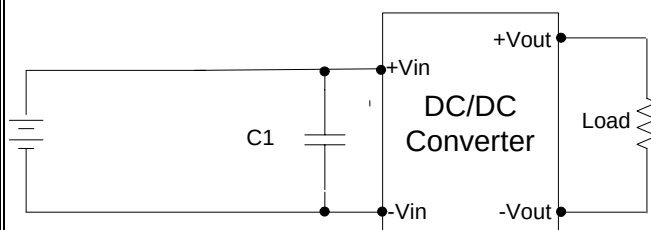
NOTE: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

3 EUT DESCRIPTION

Product	DC-DC Converter
Model	PAW/PBW SERIES
Brand	DANUBE
Applicant	Danube Enterprise Co., Ltd.
Manufacturer	Danube Enterprise Co., Ltd.
Housing material	Metal
EUT Type	☒ Engineering Sample. ☐ Product Sample. ☐ Mass Product Sample.
Serial Number	80826401
Received Date	August 26, 2008
Power Source	For model: PBWS-4803.3 (I/P: 36-75VDC, O/P: 3.3VDC, 700mA) For model: PBWS-2405 (I/P: 18-36VDC, O/P: 5VDC, 600mA) For model: PBWD-0515 (I/P: 4.5-9VDC, O/P: +/-15VDC, +/-100mA) For model: PBWS-0515 (I/P: 4.5-9VDC, O/P: 15VDC, 200mA) For model: PBWD-4805 (I/P: 36-75VDC, O/P: +/-5VDC, +/-300mA) For model: PBWS-4803.3-3K (I/P: 36-75VDC, O/P: 3.3VDC)

NOTE: Client consigns six model samples to test (Model Number: **PBWS-4803.3; PBWS-2405; PBWD-0515; PBWS-0515; PBWD-4805; PBWS-4803.3-3K**). Therefore, the testing Lab. just guarantees the unit, which has been tested.

Typical applications for surge test:



Capacitance Spec.	C1
Voltage	330uF, 400VDC
Brand	HP3

	Series	Coding scheme
1	PAW Series	PAWv-xxyyJ PAWv-xxyyTggg-3K v= S(single output) D(Dual ouptut) xx=05(4.5~9V input voltage) 12(9~18V input voltage) 24(18~36V input voltage) 48(36~75V input voltage) yy=03.3(3.3V single output) 05(5V single output ; ±5V Dual output) 09(9V single output ; ±9V Dual output) 12(12V single output ; ±12V Dual output) 15(15V single output ; ±15V Dual output) 24(24V single output) J= Additional capacitance can be added from this pin to <i>pin7</i> T=4:1 input voltage Range ggg=0~9 , A~Z or blank for market purpose -3K=3KVDC Isolation(single output only)
2	PBW Series	PBWv-xxyyJ PBWv-xxyyTggg-3K v= S(single output) D(Dual ouptut) xx=05(4.5~9V input voltage) 12(9~18V input voltage) 24(18~36V input voltage) 48(36~75V input voltage) yy=03.3(3.3V single output) 05(5V single output ; ±5V Dual output) 09(9V single output ; ±9V Dual output) 12(12V single output ; ±12V Dual output) 15(15V single output ; ±15V Dual output) 24(24V single output) J= Additional capacitance can be added from this pin to <i>pin7</i> ggg=0~9 , A~Z or blank for market purpose -3K=3KVDC Isolation(single output only)

4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ mode is as the following:

EMI Test Mode:

1. Full Load

Model Number:

- (1) PBWS-4803.3
- (2) PBWS-2405
- (3) PBWD-0515
- (4) PBWS-0515
- (5) PBWD-4805
- (6) PBWS-4803.3-3K

EMS Test Mode:

1. Full Load

Model Number:

- (1) PBWS-4803.3
- (2) PBWS-2405

4.2. EUT SYSTEM OPERATION

1. Setup whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test.



5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

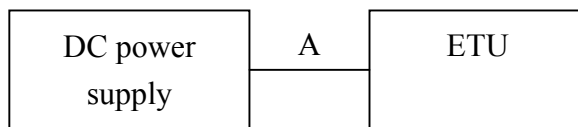
No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	DC power supply	LOKO	N/A	DOC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power Cable	Unshielded, 0.2m 1 pcs.

NOTE:

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC
Japan	VCCI
Canada	INDUSTRY CANADA
Taiwan	TAF, BSMI
Europe	TÜV NORD

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsemc.com.tw>

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz~30MHz	± 2.05 dB
Radiated emissions	30MHz ~1000MHz	± 2.39 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

**7 EMISSION TEST****7.1. CONDUCTED EMISSION MEASUREMENT****7.1.1. LIMITS**

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission room #1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N.	SCHWARZBECK	NNLK 8121	8121-446	NOV. 14, 2008 For Insertion loss
	Rohde & Schwarz	ESH 3-Z5	840062/021	SEP. 28, 2008
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL 02, 2009
TYPE N COAXIAL CABLE	SUHNER	BELDEN9913	2981	FEB. 26, 2009
Test S/W	e-3 (5.04211c) R&S (2.27)			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.1.3. TEST PROCEDURES

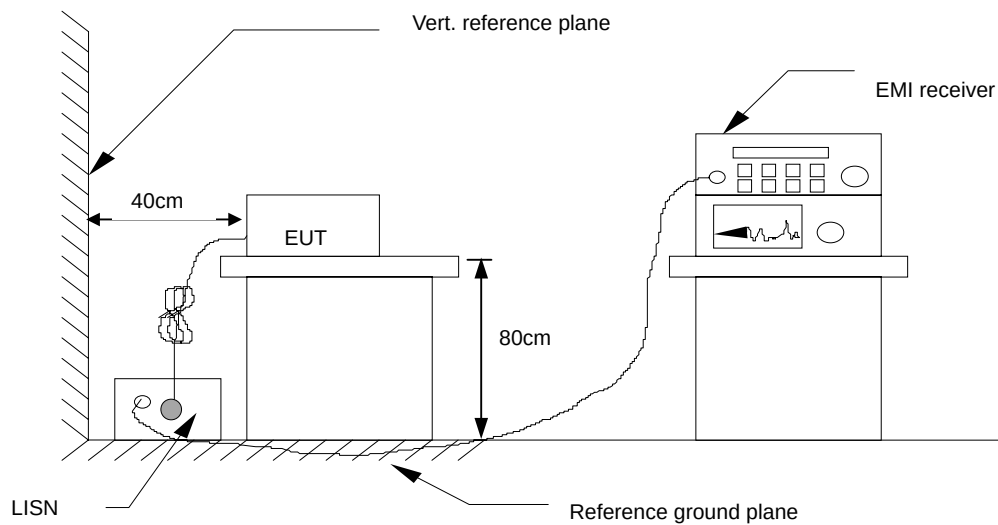
Procedure of Preliminary Test

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55022 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical actual usage as per EN 55022.
- The test equipment EUT installed received DC power through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the Average limit in Q.P. mode, then the emission signal was re-checked using an Average detector.
- The test data of the worst-case condition(s) was recorded.

7.1.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector
x.xx	9.6	0.1	15.7	25.4	46	-20.6	QP

- REMARKS :**
- Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB)
 - Over Limit value (dB) = Level (dBuV) – Limit Line (dBuV)

7.1.6. TEST RESULTS

NOTE: This EUT has not connection to AC Source directly. No applicability for this test.

**7.2. RADIATED EMISSION MEASUREMENT****7.2.1. LIMITS**

FREQUENCY (MHz)	dBuV/m (At 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2.2. TEST INSTRUMENTS

Open Area Test Site # 5				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100294	JAN. 24, 2009
Pre-Amplifier	CCS	EPA-3000A	-----	N.C.R.
TYPE N COAXIAL CABLE	SUHNER	CHA9513	004	AUG. 23, 2009
BILOG ANTENNA	Sunol sciences	JB1	A070506-1	JUL. 11, 2009
Test Software	EMI e-3 / AUDIX (5.04211c)			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

7.2.3. TEST PROCEDURE

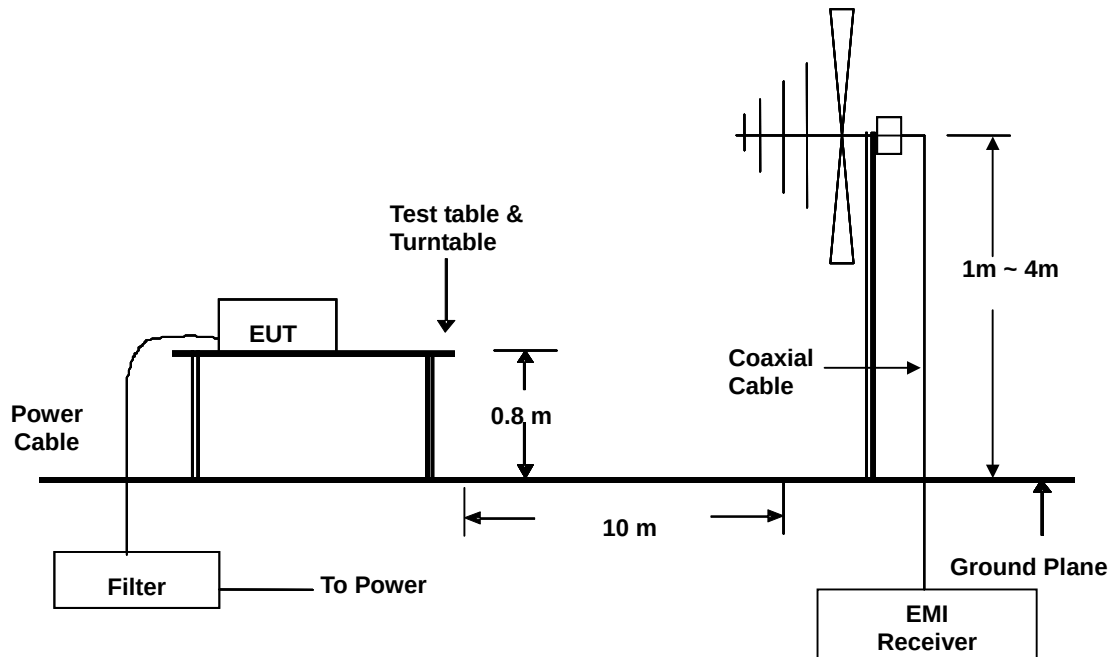
Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55022.
- All I/O cables were positioned to simulate typical usage as per EN 55022.
- The EUT received DC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.
- The antenna was placed at 10 meter away from the EUT as stated in EN 55022. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.

7.2.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.5. DATA SAMPLE

Freq. (MHz)	Reading Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dBuV/m)
XX.XX	14.00	12	0.2	26.2	30	-3.80

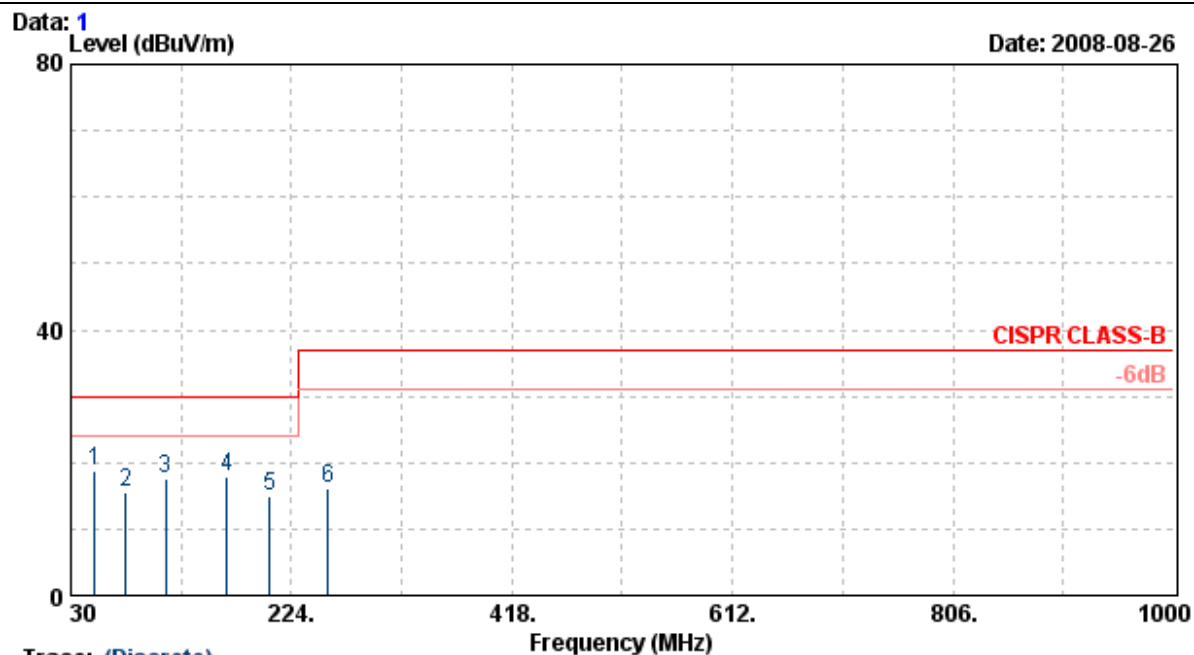
REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



7.2.6. TEST RESULTS

Model No.	PBWS-4803.3	Test Mode	Full Load
Environmental Conditions	40°C , 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



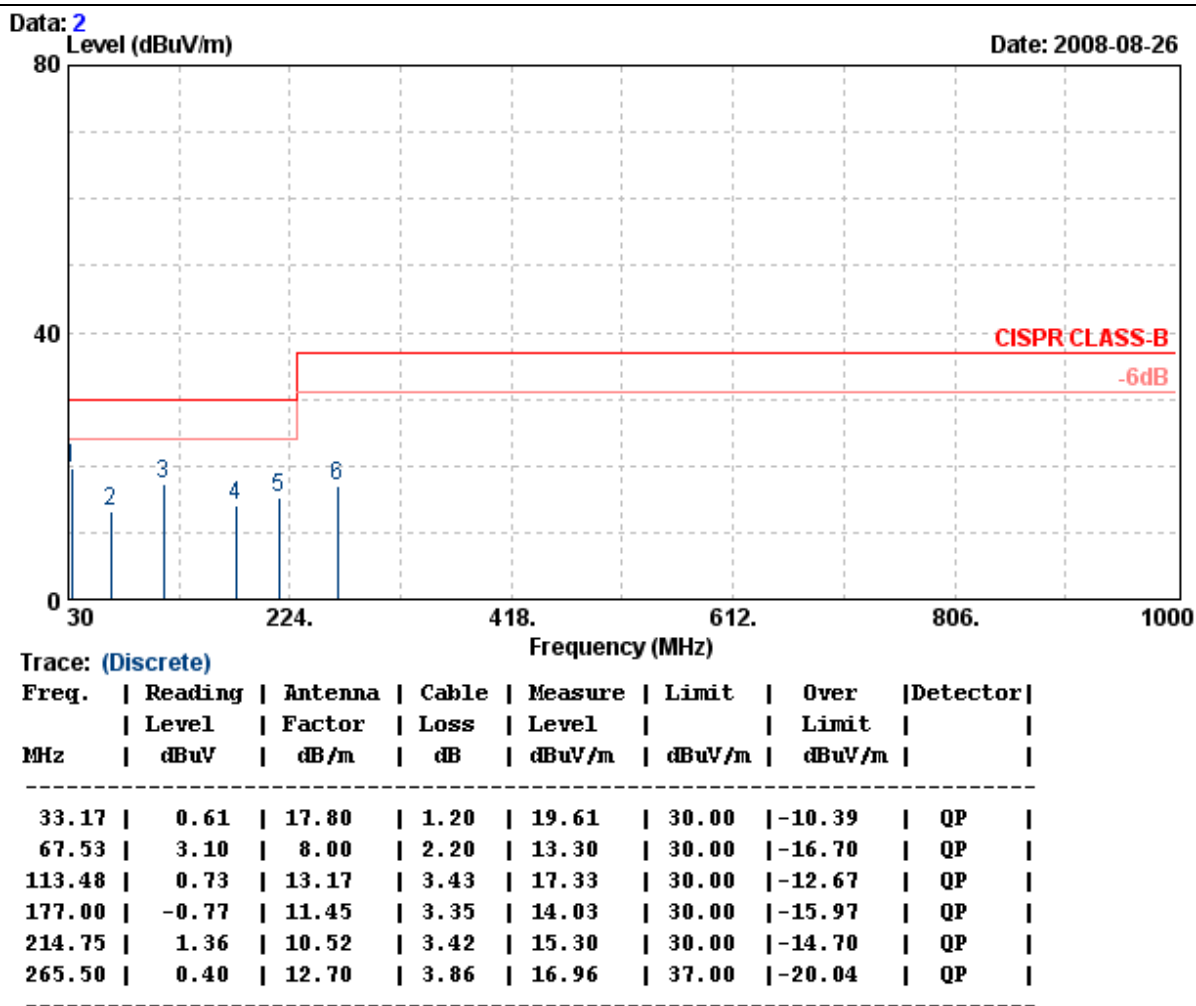
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
MHz	Level	Factor	Loss	Level	Limit	Limit	
	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
51.14	9.49	7.70	1.63	18.82	30.00	-11.18	QP
78.50	5.17	7.80	2.64	15.61	30.00	-14.39	QP
113.23	0.92	13.17	3.43	17.52	30.00	-12.48	QP
167.44	2.44	11.98	3.33	17.75	30.00	-12.25	QP
205.25	0.24	11.45	3.35	15.03	30.00	-14.97	QP
256.00	0.44	11.90	3.77	16.11	37.00	-20.89	QP

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-4803.3	Test Mode	Full Load
Environmental Conditions	40°C, 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo

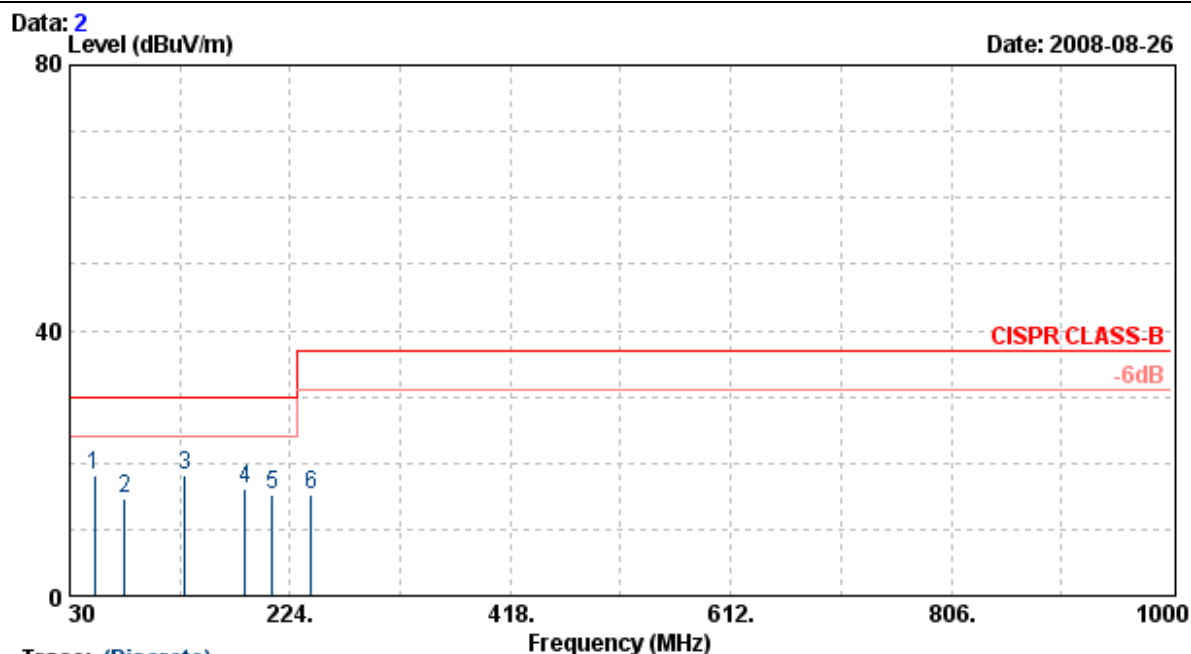


REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-2405	Test Mode	Full Load
Environmental Conditions	39.5°C, 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



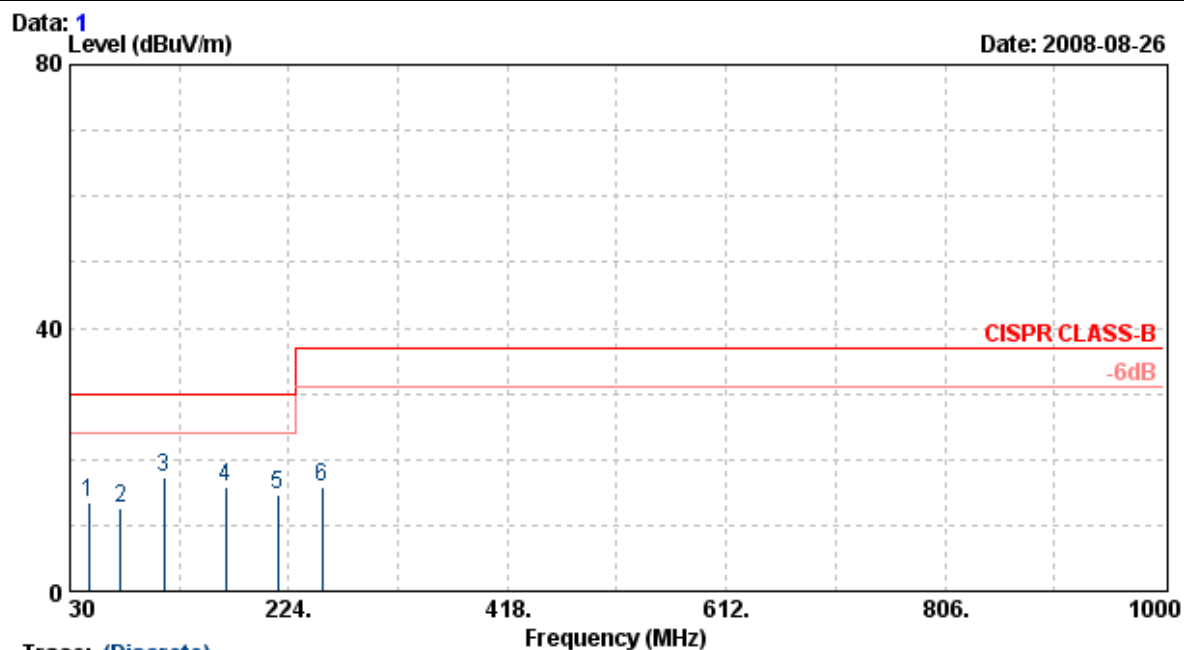
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
Level	Factor	Loss	Level	Limit	Limit		
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
51.60	8.72	7.70	1.63	18.05	30.00	-11.95	QP
78.58	4.34	7.80	2.64	14.78	30.00	-15.22	QP
131.08	1.13	13.52	3.48	18.13	30.00	-11.87	QP
184.32	1.61	11.30	3.35	16.26	30.00	-13.74	QP
208.25	1.01	10.82	3.37	15.20	30.00	-14.80	QP
242.40	0.26	11.45	3.65	15.36	37.00	-21.64	QP

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-2405	Test Mode	Full Load
Environmental Conditions	39.5°C, 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



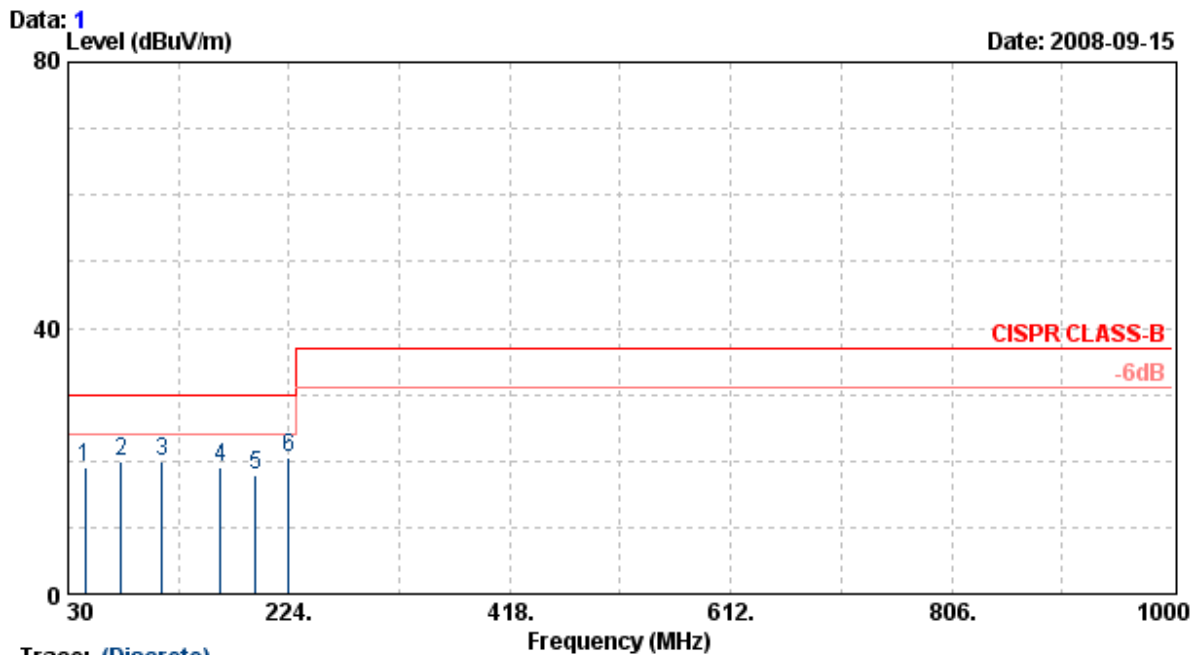
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
Level	Factor	Loss	Level	Limit	Limit		
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
47.10	2.97	9.10	1.55	13.62	30.00	-16.39	QP
74.58	2.06	8.00	2.47	12.53	30.00	-17.47	QP
113.45	0.59	13.17	3.43	17.19	30.00	-12.81	QP
167.83	0.44	11.98	3.33	15.75	30.00	-14.25	QP
214.73	0.84	10.52	3.42	14.78	30.00	-15.22	QP
253.55	0.22	11.75	3.74	15.71	37.00	-21.29	QP

- REMARKS :
- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
 - 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWD-0515	Test Mode	Full Load
Environmental Conditions	33.4°C, 53 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



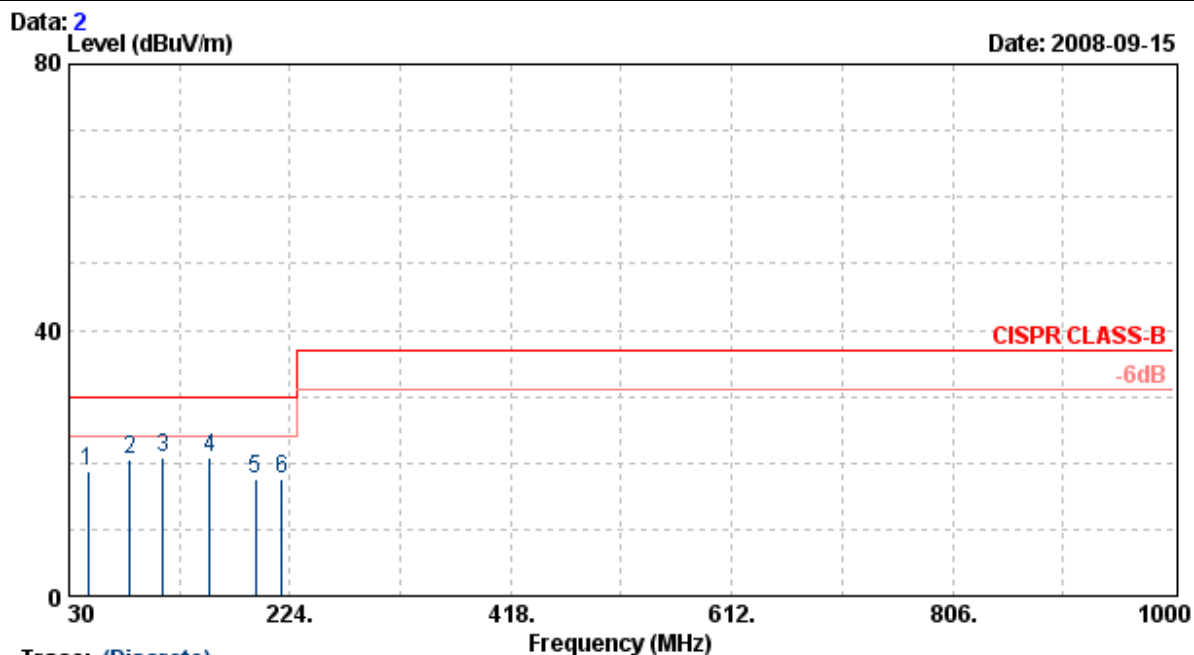
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
MHz	Level	Factor	Loss	Level	Limit	Limit	
	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
44.80	7.40	10.10	1.49	18.99	30.00	-11.01	
76.39	9.50	7.90	2.56	19.96	30.00	-10.04	
112.30	3.30	13.05	3.43	19.78	30.00	-10.22	
163.80	3.50	12.12	3.32	18.94	30.00	-11.06	
194.50	2.80	11.90	3.32	18.02	30.00	-11.99	
223.40	6.10	10.79	3.49	20.38	30.00	-9.62	

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWD-0515	Test Mode	Full Load
Environmental Conditions	33.4°C, 53 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



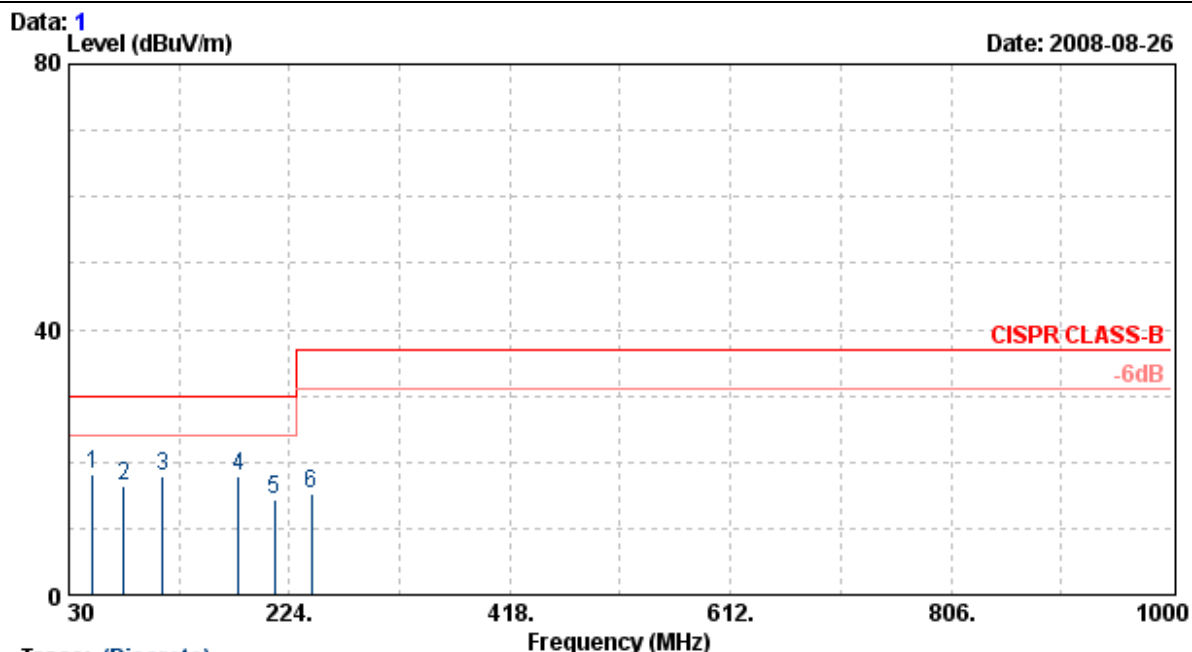
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
	Level	Factor	Loss	Level		Limit	
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
46.50	7.90	9.25	1.53	18.68	30.00	-11.32	
83.25	10.20	7.52	2.90	20.62	30.00	-9.38	
112.35	4.30	13.05	3.43	20.78	30.00	-9.22	
153.40	5.20	12.20	3.38	20.78	30.00	-9.22	
193.50	2.50	11.80	3.32	17.62	30.00	-12.38	
216.50	3.70	10.58	3.43	17.71	30.00	-12.29	

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-0515	Test Mode	Full Load
Environmental Conditions	39.4°C, 47 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



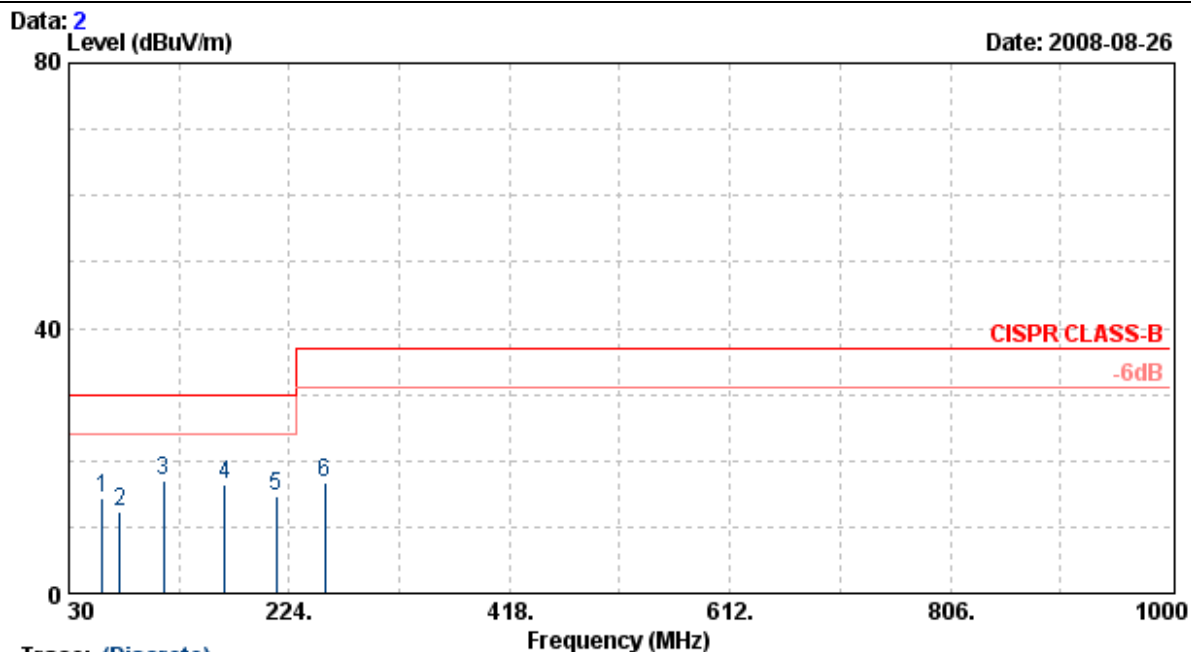
Trace: (Discrete)

Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
Level	Factor	Loss	Level		Limit		
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
51.03	8.78	7.70	1.63	18.11	30.00	-11.89	QP
78.50	5.89	7.80	2.64	16.33	30.00	-13.67	QP
112.64	1.37	13.05	3.43	17.85	30.00	-12.15	QP
179.03	3.19	11.35	3.36	17.90	30.00	-12.10	QP
210.95	0.61	10.43	3.39	14.43	30.00	-15.57	QP
243.73	0.14	11.47	3.65	15.27	37.00	-21.73	QP

REMARKS : 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-0515	Test Mode	Full Load
Environmental Conditions	39.4°C, 47 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



Trace: (Discrete)

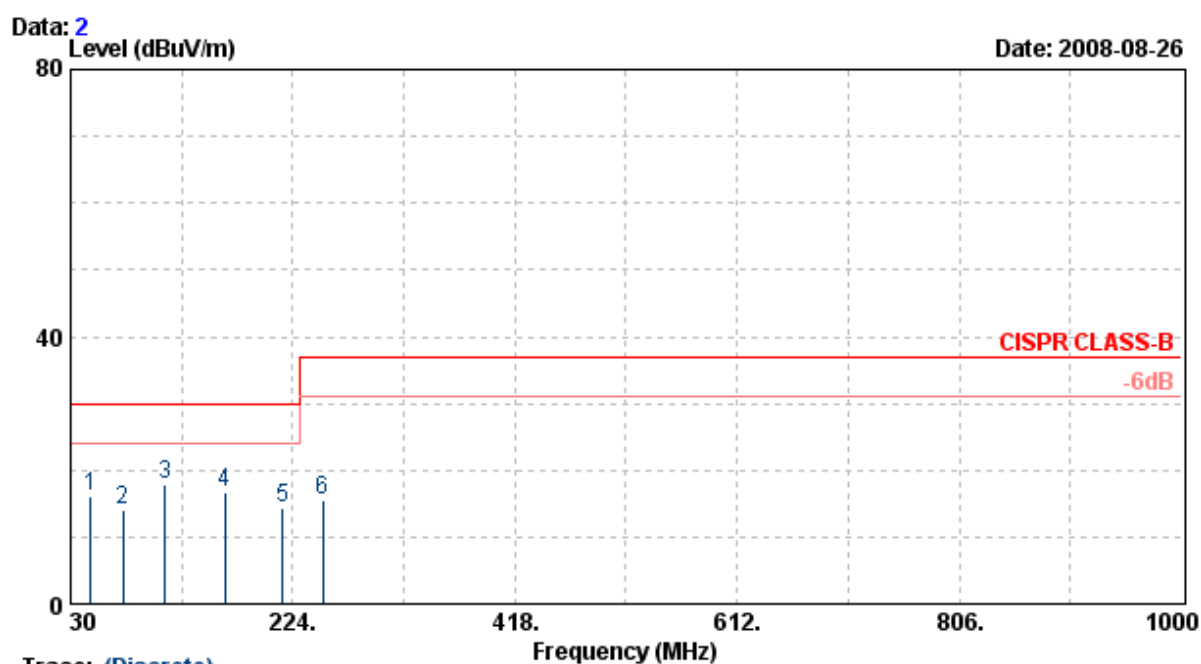
Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
Level	Factor	Loss	Level	Limit	Limit		
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
59.40	5.20	7.40	1.87	14.47	30.00	-15.53	QP
74.58	1.84	8.00	2.47	12.31	30.00	-17.69	QP
113.48	0.40	13.17	3.43	17.00	30.00	-13.00	QP
167.63	1.01	11.98	3.33	16.32	30.00	-13.68	QP
212.43	0.89	10.46	3.40	14.75	30.00	-15.25	QP
255.40	0.96	11.85	3.76	16.57	37.00	-20.43	QP

REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWD-4805	Test Mode	Full Load
Environmental Conditions	38.9°C, 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo

**Trace: (Discrete)**

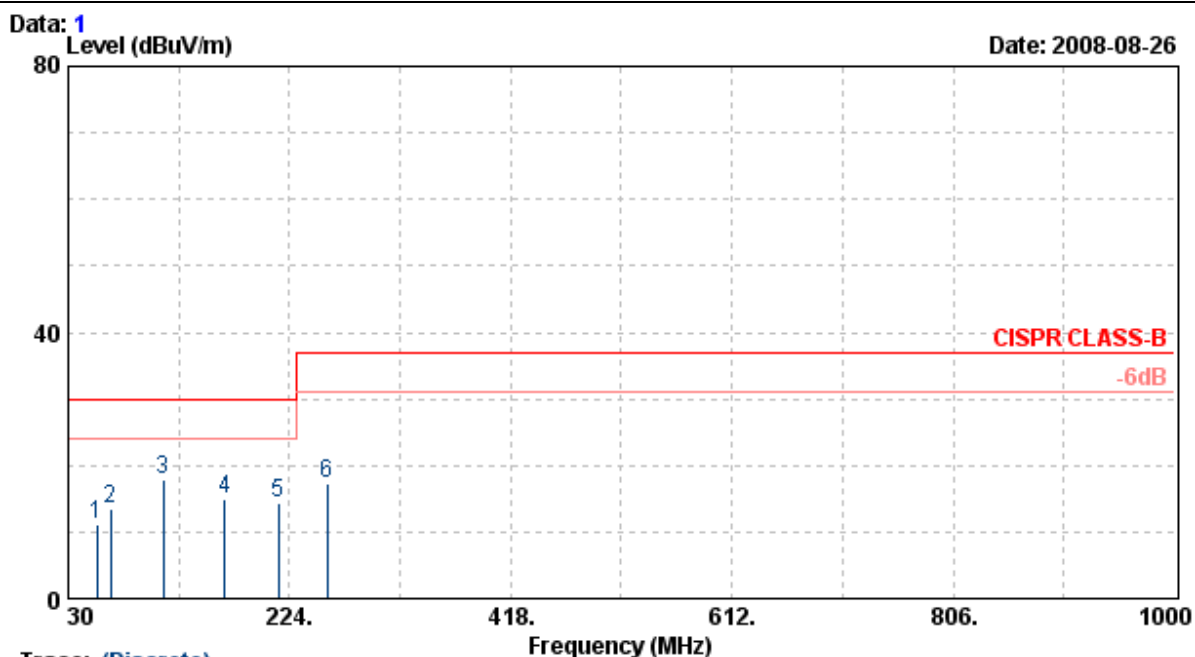
Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
MHz	Level	Factor	Loss	Level	Limit	Limit	
	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
47.69	5.54	9.10	1.55	16.19	30.00	-13.82	QP
75.43	3.70	7.95	2.52	14.17	30.00	-15.83	QP
112.65	1.54	13.05	3.43	18.02	30.00	-11.98	QP
165.03	1.23	12.10	3.32	16.65	30.00	-13.35	QP
215.05	0.41	10.55	3.43	14.39	30.00	-15.61	QP
250.65	0.31	11.60	3.71	15.62	37.00	-21.38	QP

REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWD-4805	Test Mode	Full Load
Environmental Conditions	38.9°C, 48 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



Trace: (Discrete)

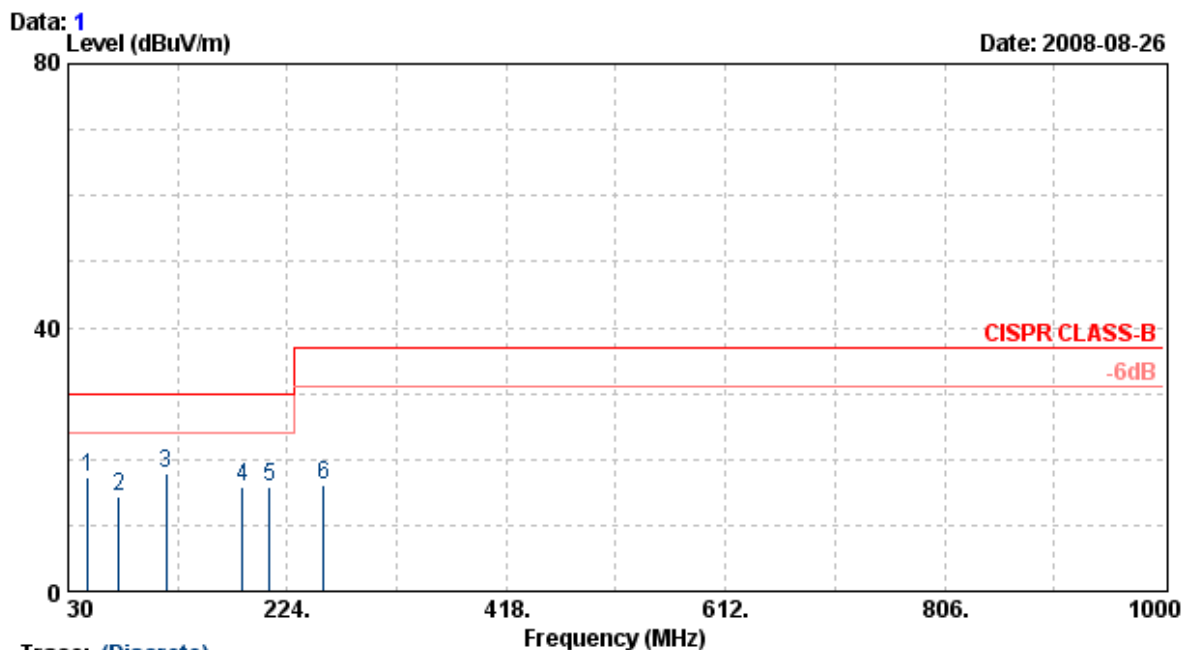
Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
MHz	Level	Factor	Loss	Level	Limit	Limit	
	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
55.30	2.22	7.30	1.75	11.27	30.00	-18.73	QP
67.53	3.34	8.00	2.20	13.54	30.00	-16.46	QP
113.50	1.20	13.17	3.43	17.80	30.00	-12.20	QP
167.50	-0.47	11.98	3.33	14.84	30.00	-15.16	QP
214.75	0.43	10.52	3.42	14.37	30.00	-15.63	QP
257.00	1.58	11.95	3.78	17.31	37.00	-19.69	QP

REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-4803.3-3K	Test Mode	Full Load
Environmental Conditions	39.9°C, 50 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



Trace: (Discrete)

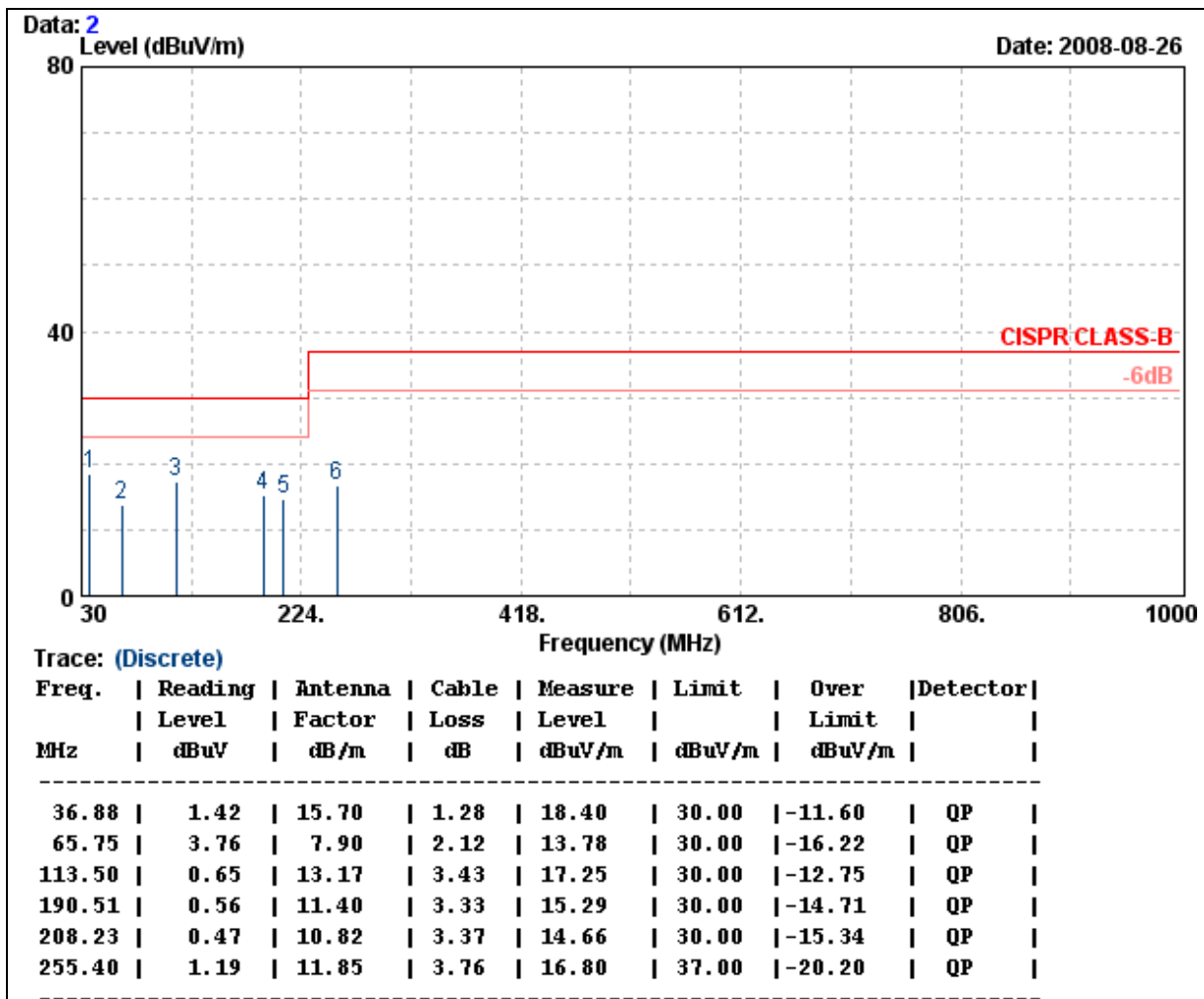
Freq.	Reading	Antenna	Cable	Measure	Limit	Over	Detector
	Level	Factor	Loss	Level		Limit	
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dBuV/m	
47.55	6.67	9.10	1.55	17.32	30.00	-12.69	QP
75.00	3.89	8.00	2.47	14.36	30.00	-15.64	QP
116.75	1.10	13.48	3.44	18.02	30.00	-11.98	QP
184.33	1.11	11.30	3.35	15.76	30.00	-14.24	QP
208.25	1.58	10.82	3.37	15.77	30.00	-14.23	QP
256.00	0.42	11.90	3.77	16.09	37.00	-20.91	QP

REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)



Model No.	PBWS-4803.3-3K	Test Mode	Full Load
Environmental Conditions	39.9°C, 50 % RH	Resolution Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Rock Guo



REMARKS :

- 1.Level (dBuV/m) = Read Level (dBuV) + Antenna Factor (dB/m) + Cable loss (dB)
- 2.Over Limit value (dB) = Level (dBuV/m)-Limit Line(dBuV/m)

**7.3. HARMONICS CURRENT MEASUREMENT****7.3.1. LIMITS OF HARMONICS CURRENT MEASUREMENT**

Limits for Class A equipment		Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	2.30
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
15<=n<=39	0.15x15/n	15<=n<=39	3.85/n	0.15x15/n
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
8<=n<=40	0.23x8/n			

NOTE: 1. Class A and Class D are classified according to item 7.3.3.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

7.3.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	DEC. 19, 2008
Test S/W	H/F HA 1600 PC LINK Field Probe			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.3.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 m above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- The classification of EUT is according to section 5 of EN 61000-3-2.
- The EUT is classified as follows:

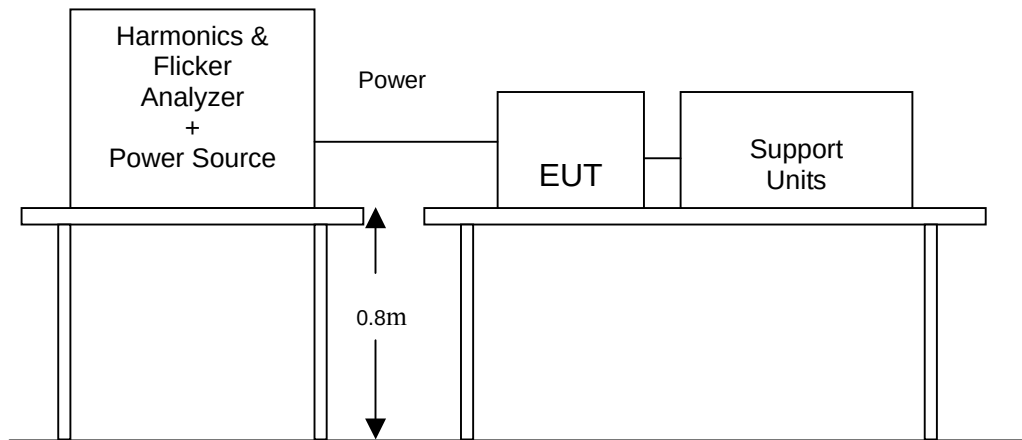
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600 W of the following types:
Personal computers and personal computer monitors and television receivers.

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.3.4. TEST SETUP

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.3.5. TEST RESULTS

✖ This EUT has not connection to AC Source direct. No applicable for this test.

**7.4. VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT****7.4.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKS MEASUREMENT**

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.4.2. TEST INSTRUMENTS

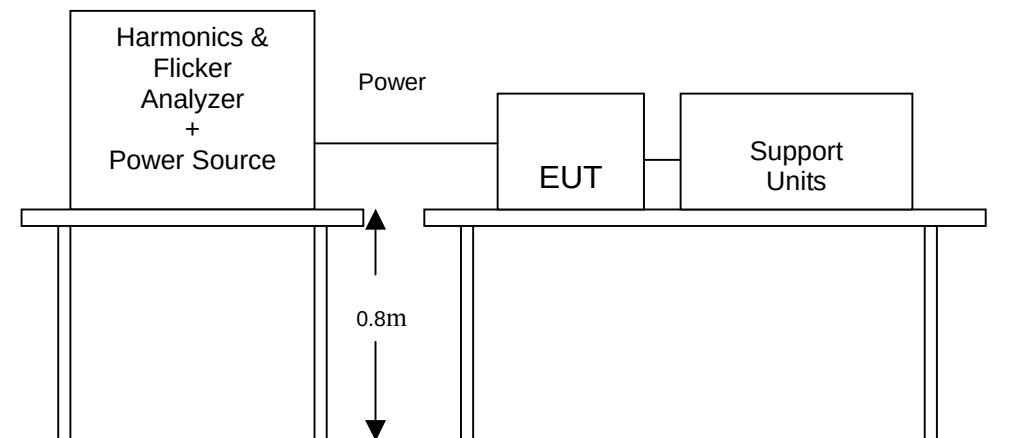
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonics Analyzer	TTI	HA1600	198202	DEC. 19, 2008
Test S/W	H/F HA 1600 PC LINK Field Probe			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.4.3. TEST PROCEDURE

- The EUT was placed on the top of a wooden table 0.8 m above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4.5. TEST RESULTS

✖ This EUT has not connection to AC Source direct. No applicable for this test.

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	EN 55024: 1998 + A1: 2001 + A2: 2003	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	IEC 61000-4-2	Electrostatic Discharge – ESD: 8kV Air Discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~1000 MHz, 3V/m, 80% AM(1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst - EFT, Power line: 0.5kV Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, DC Port ~ Lines to line : 0.5kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test –CS: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion A
	IEC 61000-4-8	Power frequency magnetic field immunity test 50Hz, 1A/m Performance Criterion A
	IEC 61000-4-11	There is no requirement for DC power input port.



8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

Criteria A:	The apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria B:	After test, the apparatus shell continues to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. However, no change of operating state if stored data is allowed to persist after the test. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criteria C:	Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.



8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard: EN 61000-4-2

Discharge Impedance: 330 ohm / 150 pF

Discharge Voltage: Air Discharge: 2kV ; 4 kV ; 8kV

Polarity: Positive & Negative

Number of Discharge: Minimum 10 times at each test point

Discharge Mode: Single Discharge
1 second minimum

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD Simulator	NoiseKen	ESS-2002	ESS0523940	JUL. 26, 2009

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

8.3.3. TEST PROCEDURE

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:

The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **Horizontal Coupling Plane (HCP)**. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

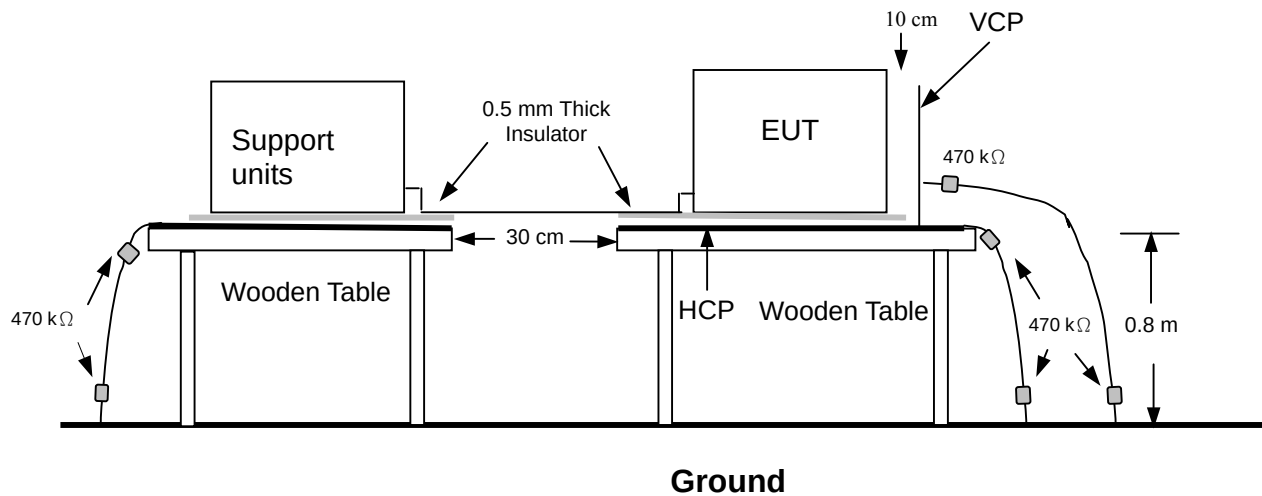
b) Air discharges at slots and apertures and insulating surfaces:

On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with IEC 61000-4-2:

- a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
- b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
- c) The time interval between two successive single discharges was at least 1 second.
- d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 m from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
- g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane (VCP)** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5 m x 0.5 m) was placed vertically to and 0.1 m from the EUT.

8.3.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 m high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25 mm thick, and 2.5 m square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6 m x 0.8 m) was placed on the table and attached to the **GRP** by means of a cable with 940k Ω total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5 mm thickness. A distance of 1 m minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1 m thickness. The GRP consisted of a sheet of aluminum that is at least 0.25 mm thick, and 2.5 m square connected to the protective grounding system and extended at least 0.5 m from the EUT on all sides.

**8.3.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	26 °C	Humidity	46 % RH
Pressure	1023 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion B	

Air Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Back	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Top	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

Contact Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
N/A							

Please refer to ESD test photo on next page for detail discharge point

Discharge To Horizontal Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	±6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Back	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

Discharge To Vertical Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Back	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	26 °C	Humidity	46 % RH
Pressure	1023 mbar	Tested By	Agun Huang
Required Passing Performance		Criterion B	

Air Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 8 kV	Pass	Fail	Performance Criterion	Observation
Back	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Top	☒	☒	☒	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

Contact Discharge							
Test Points	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
N/A							

Please refer to ESD test photo on next page for detail discharge point

Discharge To Horizontal Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Back	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

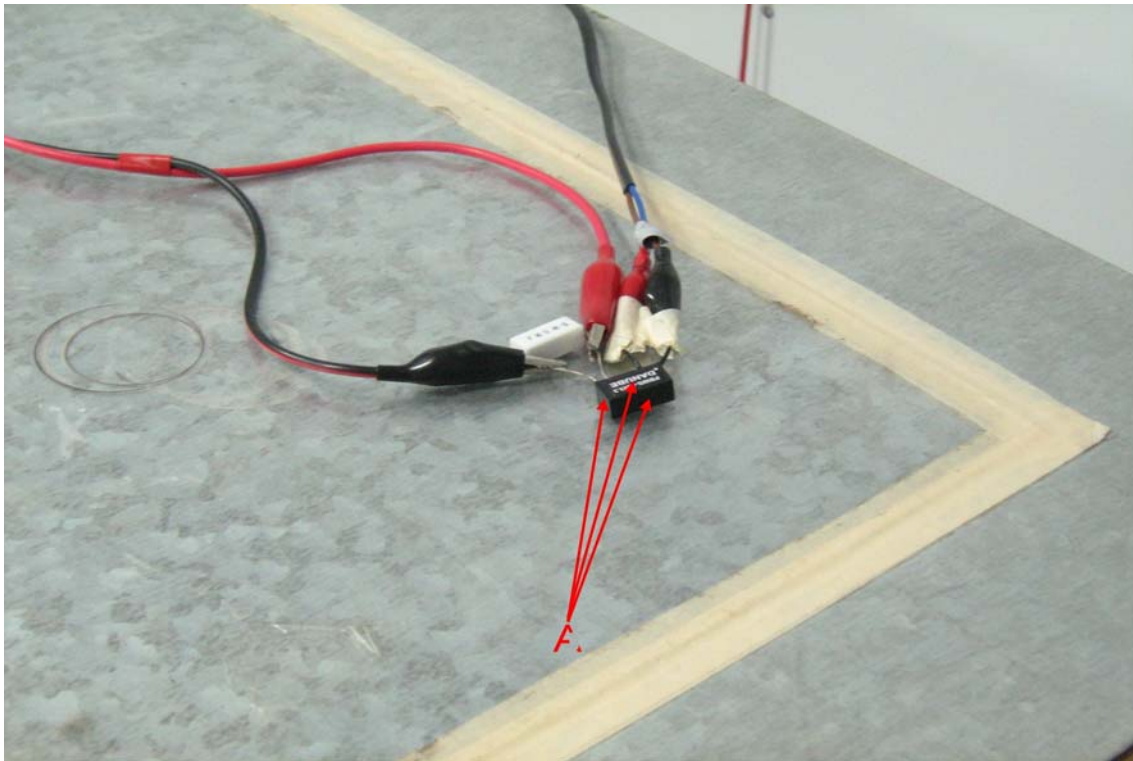
Discharge To Vertical Coupling Plane							
Side of EUT	Test Levels			Results			
	± 2 kV	± 4 kV	± 6 kV	Pass	Fail	Performance Criterion	Observation
Front	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Back	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Left	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3
Right	☒	☒	☐	☒	☐	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

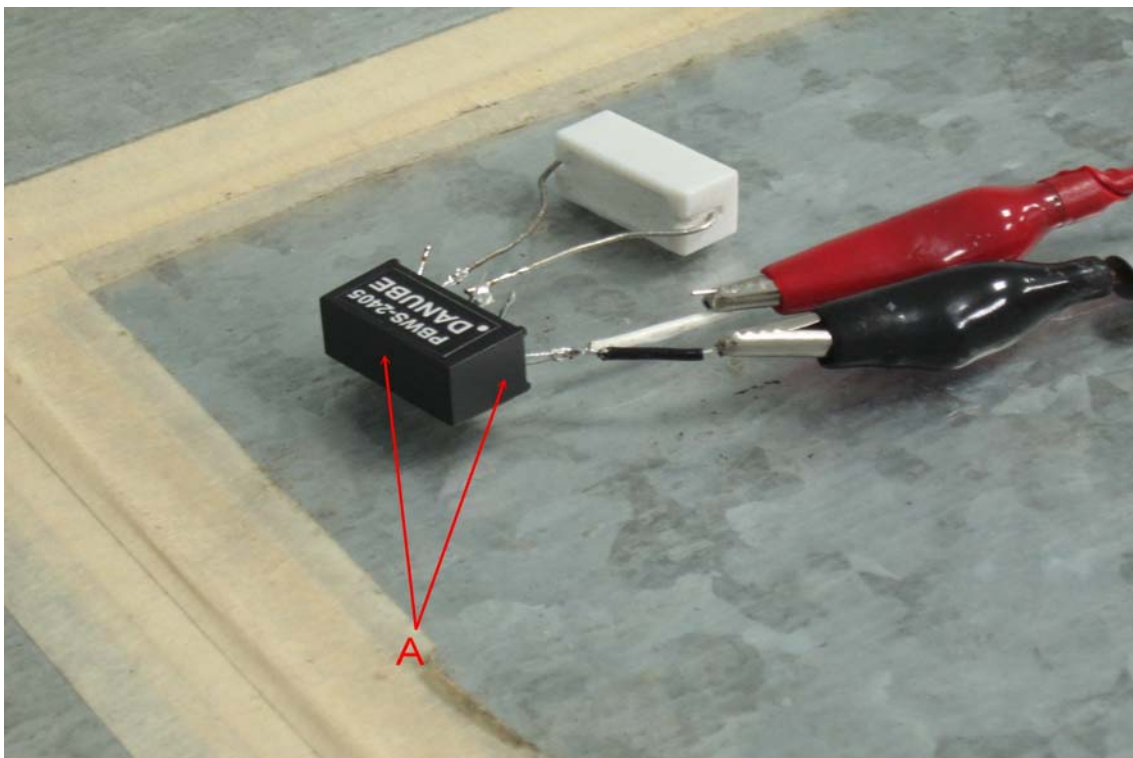
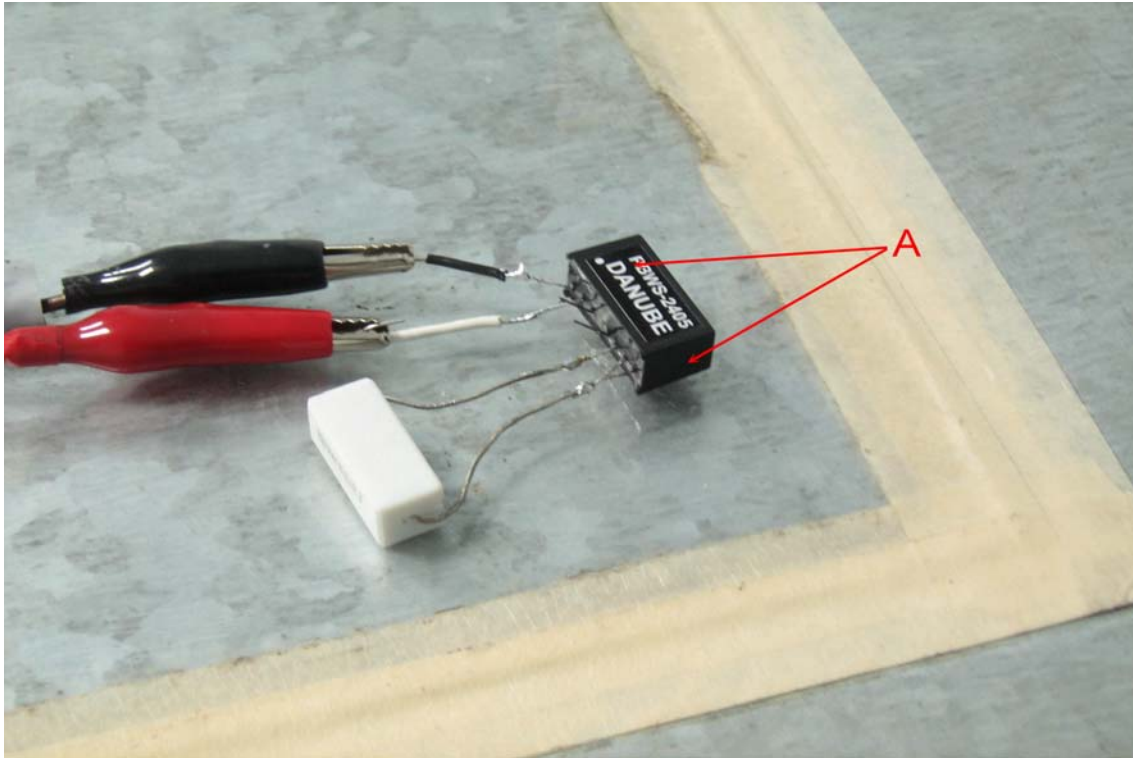
The Photo for Discharge Points of EUT

For model: PBWS-4803.3



The Photo for Discharge Points of EUT

For model: PBWS-2405



**8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)****8.4.1. TEST SPECIFICATION****Basic Standard:** EN 61000-4-3**Frequency Range:** 80 MHz ~1000 MHz,**Field Strength:** 3 V/m**Modulation:** 1kHz Sine Wave, 80%, AM Modulation**Frequency Step:** 1 % of preceding frequency value**Polarity of Antenna:** Horizontal and Vertical**Test Distance:** 3 m**Antenna Height:** 1.5m**8.4.2. TEST INSTRUMENT**

RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	SYNNEX	BTO -LMIW300 - GB	A41202-0031	N.C.R.
LCD Monitor	Acer	AL1715sm	ETL13071994430236 6RH01	N.C.R.
Keyboard	SYNNEX	5211A	G4430091266	N.C.R.
Amplifier Freq. Range :80MHz ~ 1GHz	AR	150W1000M3	310037	DEC. 05 , 2009
Amplifier Freq. Range :0.8MHz ~ 3GHz	AR	60S1G3M3	310102	DEC. 05 , 2009
RF TEST Controller Freq. Range :~18GHz	AR	SC1000M1	310126	DEC. 05 , 2009
Digital SIGNAL GENERATOR	HP	ESG-D3000A	US36260655	DEC. 20, 2008
RF Power Meter	BOONTON	4232A-01-02	122202	DEC. 24 , 2008
Log – Periodic Antenna	AR	AT5080	309817	N.C.R.
RF Communications test set	HP	8920A	3412A04298	NOV. 01, 2008
Test S/W	RS SW1005 R1_4			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

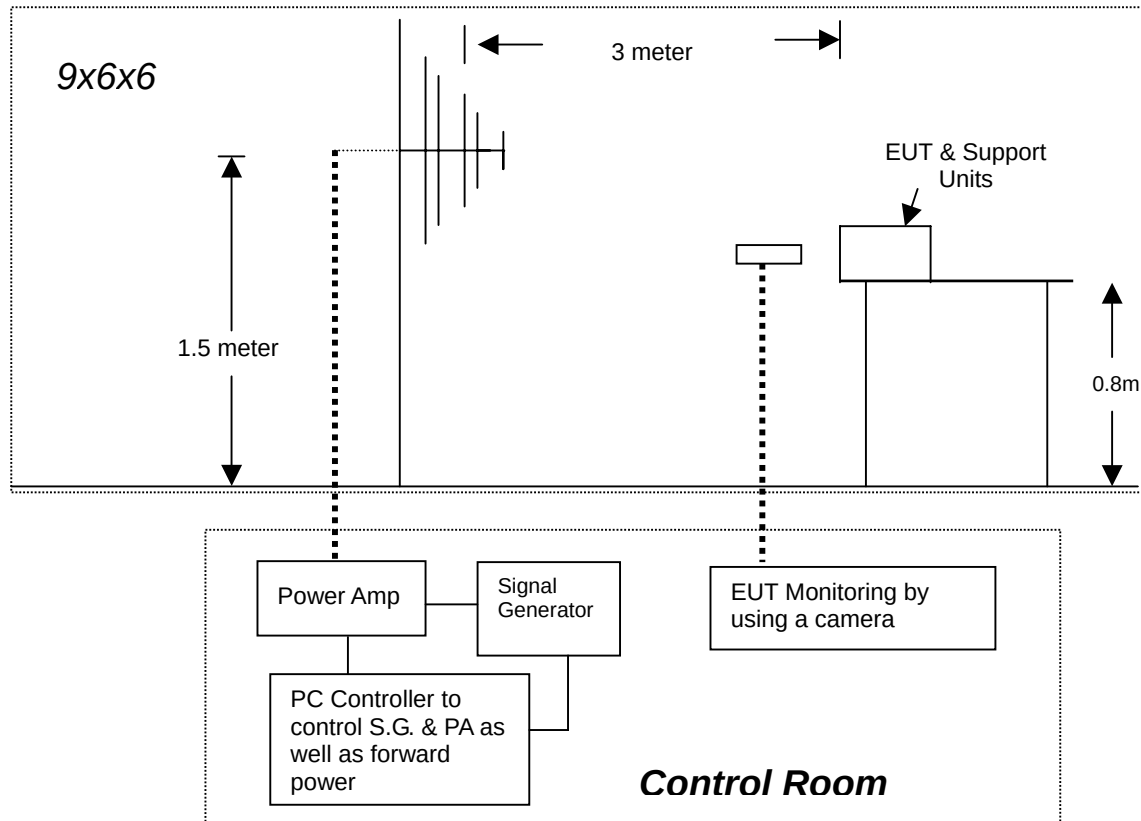
2. N.C.R.= No Calibration Required.

8.4.3. TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-3

- a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 m from the EUT.
- b) The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.
- c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- e) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 m in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 m in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

**8.4.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	25 °C	Humidity	42 % RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Dwell Time	3 sec.		
Required Passing Performance	Criterion A		

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	0	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	90	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	180	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	270	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	25 °C	Humidity	42 % RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Dwell Time	3 sec.		
Required Passing Performance	Criterion A		

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Result
80 ~ 1000	V&H	0	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	90	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	180	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS
80 ~ 1000	V&H	270	3	Note ☒ 1 ☐ 2 ☐ 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**8.5. ELECTRICAL FAST TRANSIENT (EFT)****8.5.1. TEST SPECIFICATION****Basic Standard:** EN 61000-4-4**Test Voltage:** Power Line: 0.5 kV**Polarity:** Positive & Negative**Impulse Frequency:** 5 kHz**Impulse Wave-shape:** 5/50 ns**Burst Duration:** 15 ms**Burst Period:** 3 Hz**Test Duration:** Not less than 1 min.**8.5.2. TEST INSTRUMENT**

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	JUN. 18, 2009
Test S/W	CE Ware 3.00b			

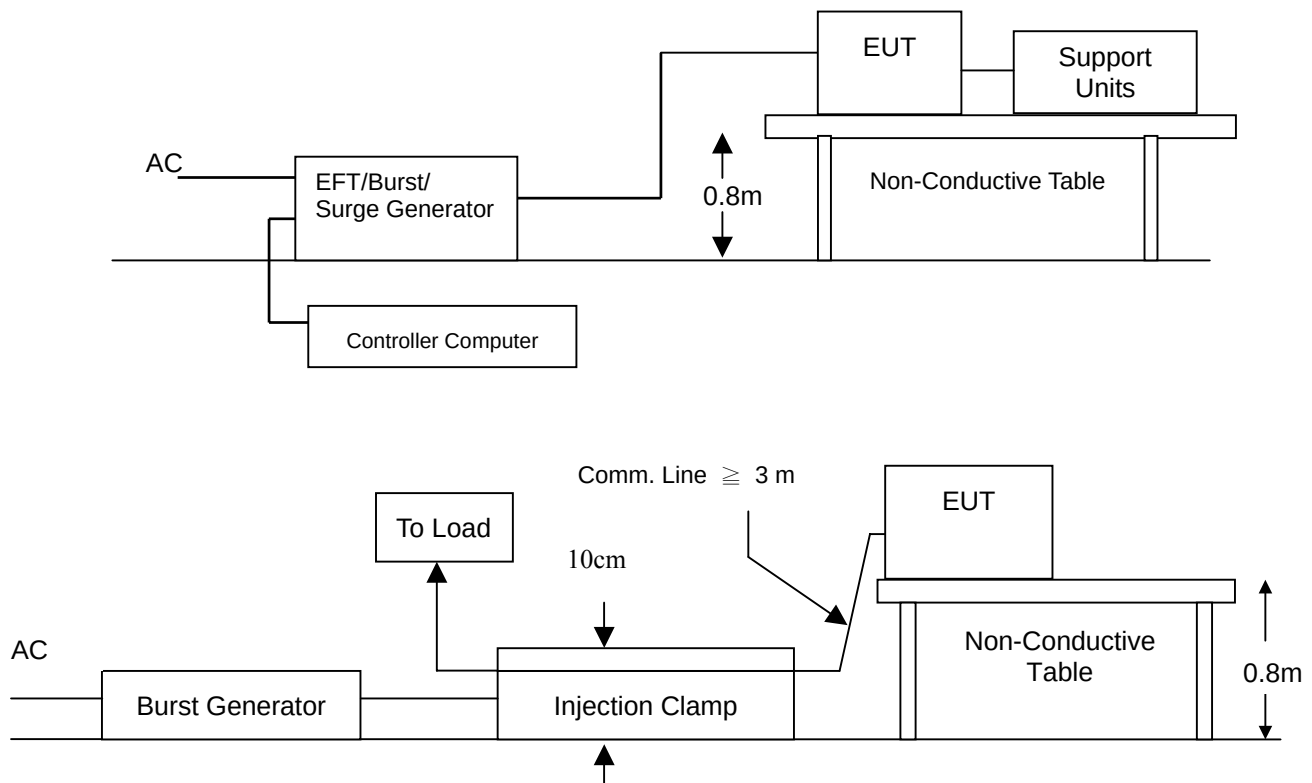
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R.= No Calibration Required.

8.5.3. TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 m.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

8.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.8 m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system. A minimum distance of 0.5 m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1 m thick. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system.

**8.5.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	24.6 °C	Humidity	47 % RH
Pressure	1023 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion B	

POWER

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
L+ N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

SIGNAL

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
N/A					

Characteristics of the fast transient/burst generator

Burst duration	Burst Period	Repetition Rate	Rise time	Duration
15 ms ⁺ 20%	300 ms ⁺ 20%	5 kHz	5 ns ⁺ 30%	50 ns ⁺ 30%

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	24.6 °C	Humidity	47 % RH
Pressure	1023 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion B	

POWER

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
L+ N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

SIGNAL

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
N/A					

Characteristics of the fast transient/burst generator

Burst duration	Burst Period	Repetition Rate	Rise time	Duration
15 ms ⁺ 20%	300 ms ⁺ 20%	5 kHz	5 ns ⁺ 30%	50 ns ⁺ 30%

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**8.6. SURGE IMMUNITY TEST****8.6.1. TEST SPECIFICATION****Basic Standard:** EN 61000-4-5**Wave-Shape:** Combination Wave
1.2/50 us Open Circuit Voltage
8/20 us Short Circuit Current**Test Voltage:** DC port ~ Line to ground : 0.5 kV;**Surge Input/Output:** Power Line: L-N
Telecommunication line: T-Ground / R-Ground**Generator Source Impedance:** 2 ohm between networks
12 ohm between network and ground**Polarity:** Positive/Negative**Phase Angle:** 0 / 90 / 180/ 270**Pulse Repetition Rate:** 2 times / min. (maximum)**Number of Tests:** 5 positive and 5 negative at selected points**8.6.2. TEST INSTRUMENT**

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	JUN. 18, 2009
Test S/W	CE Ware 3.00b			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.

8.6.3. TEST PROCEDURE**a) For EUT power supply:**

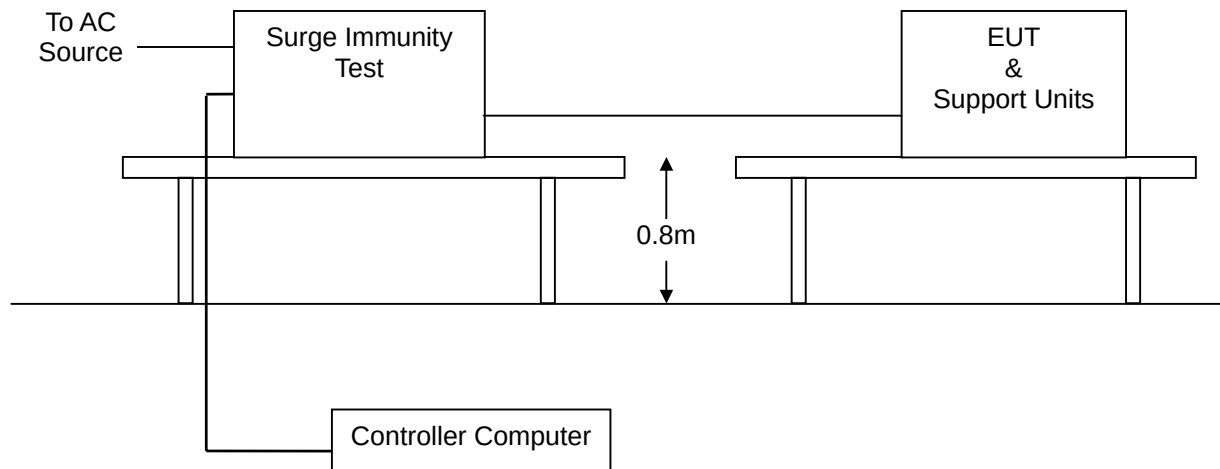
The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 m in length.

b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:

The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 m in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 m in length.

8.6.4. TEST SETUP

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**8.6.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	24.6 °C	Humidity	47 % RH
Pressure	1023 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L – N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

Phase shifting	Repetition Rate	Waveform parameter	Coupling Rate
0°、90°、180°、270°	30 sec	Combine Wave 1.2μs/50μs 8μs /20μs	5 times
		Impedance 12 Ω / 2 Ω	Each Angle and Polarity

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	24.6 °C	Humidity	47 % RH
Pressure	1023 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion B	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L – N	+/-	0.5kV	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

Phase shifting	Repetition Rate	Waveform parameter	Coupling Rate
0° 、 90° 、 180° 、 270°	30 sec	Combine Wave 1.2μs/50μs 8μs /20μs	5 times
		Impedance 12 Ω / 2 Ω	Each Angle and Polarity

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)****8.7.1. TEST SPECIFICATION**

Basic Standard:	EN 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 Vrms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Unshielded
Coupling device:	CDN-M2 (2 wires)

8.7.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	HP	d330 uT	SGH3480LTH	N.C.R.
VGA Monitor	NEC	JC-1572VMA	6600645RA	N.C.R.
Keyboard	IBM	KB - 8923	1021424	N.C.R.
FRANKONIA CONDUCTED IMMUNITY TEST SYSTEM	CS	CIT-10/75	102C3220	SEP. 19,2008
FCC Coupling Decoupling Network Freq. range : 150KHz~230MHz	CDN	CDN M2+M3	A3011040	SEP. 7 , 2009
FCC EM Injection Clamp	-----	F-203I-23mm	449	NOV. 21, 2008
Test S/W	CS-EN61000-4-6			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration Required.



8.7.3. TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

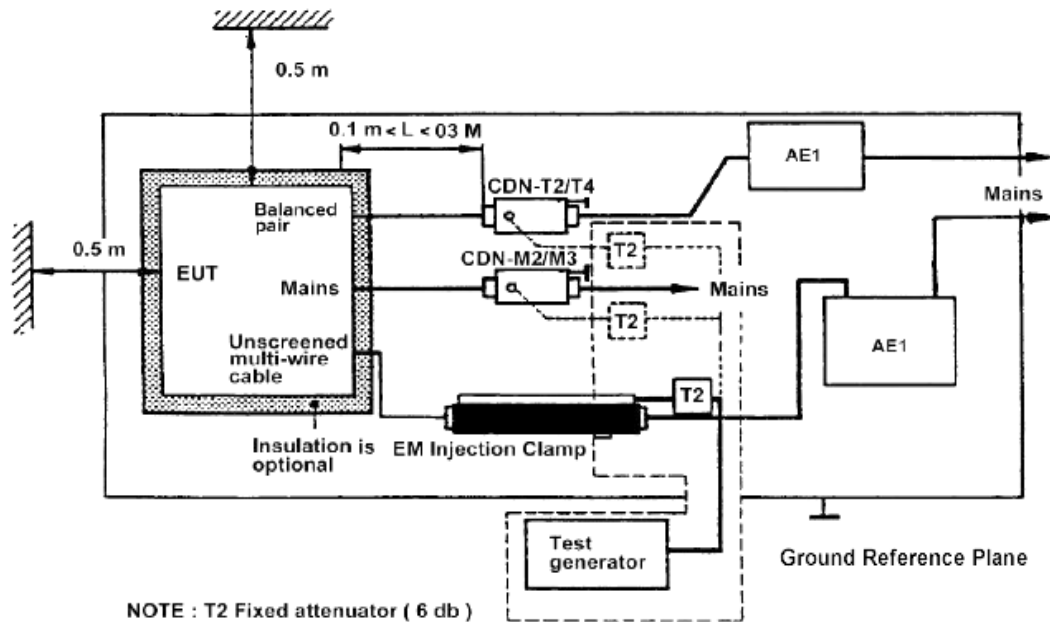
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5×10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

8.7.4. TEST SETUP



- NOTE:**
1. The EUT is setup 0.1m above Ground Reference Plane
 2. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP AND FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 m height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 m and 0.3 m from the projected geometry of the EUT on the ground reference plane.

**8.7.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	26 °C	Humidity	42% RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion A	

POWER

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Cord	CDN- ☒ M2 ☐ M3	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

SIGNAL

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
N/A						

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	26 °C	Humidity	42% RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion A	

POWER

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	Power Cord	CDN- ☒ M2 ☐ M3	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

SIGNAL

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
N/A						

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**8.8. POWER FREQUENCY MAGNETIC FIELD****8.8.1. TEST SPECIFICATION****Basic Standard:** EN 61000-4-8**Frequency Range:** 50Hz**Field Strength:** 1 A/m**Observation Time:** 1 minute**Inductance Coil:** Rectangular type, 1m x 1m**8.8.2. TEST INSTRUMENT**

Power Frequency Magnetic Field Immunity Test (IEC/EN 61000-4-8)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Frequency Magnetic Field	Schaffner	MFO 6501	154	OCT. 06, 2008
Power Frequency Magnetic Field	Schaffner	INA 702	158	OCT. 04, 2008

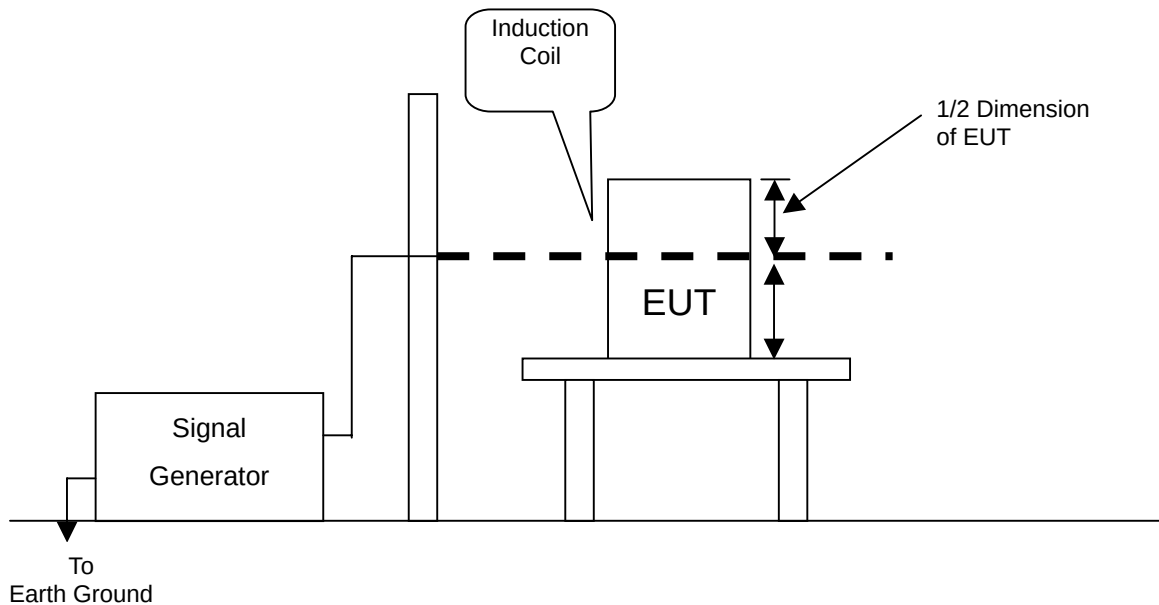
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R.= No Calibration Required.

8.8.3. TEST PROCEDURE

- The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m thick insulating support.
- The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 m of all cables used shall be exposed to the magnetic field.

8.8.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

**8.8.5. TEST RESULTS****For model: PBWS-4803.3**

Temperature	26 °C	Humidity	42% RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion A	

Power Frequency	50Hz			
Direction	Field Strength A/m	Performance Criterion	Observation	Result
X axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
Y axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
Z axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**For model: PBWS-2405**

Temperature	26 °C	Humidity	42% RH
Pressure	1022 mbar	Tested By	Taiyu Cyu
Required Passing Performance		Criterion A	

Power Frequency	50Hz			
Direction	Field Strength A/m	Performance Criterion	Observation	Result
X axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
Y axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS
Z axis	1	☒ A ☐ B ☐ C	Note ☒ 1 ☐ 2 ☐ 3	A PASS

NOTE:

1. Performance criteria A for immunity tests with phenomena of a continuous nature.
2. Performance criteria B for immunity test with phenomena of a transient nature.
3. Performance criteria C for immunity test with power interruptions, function loss and voltage dips exceeding a certain period of time.

**8.9. VOLTAGE DIP & VOLTAGE INTERRUPTIONS****8.9.1. TEST SPECIFICATION****Basic Standard:** EN 61000-4-11**Test duration time:** Minimum three test events in sequence**Interval between event:** Minimum 10 seconds**Phase Angle:** 0 / 45 / 90 / 135 / 180 / 225 / 270 / 315 / 360**Test cycle:** 3 times**8.9.2. TEST INSTRUMENT**

Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Computer	IBM	M/T 8183 - ICV	99BG137	N.C.R.
VGA Monitor	Acer	1555	917160230584200572P5C431	N.C.R.
Keyboard	HP	KB - 0133	B69360MGAPEOK5	N.C.R.
EMC Pro IMMUNITY TEST SYSTEM	KeyTek	Bi-Wave	0312231	JUN. 18, 2009
Test S/W	CE Ware 3.00b			

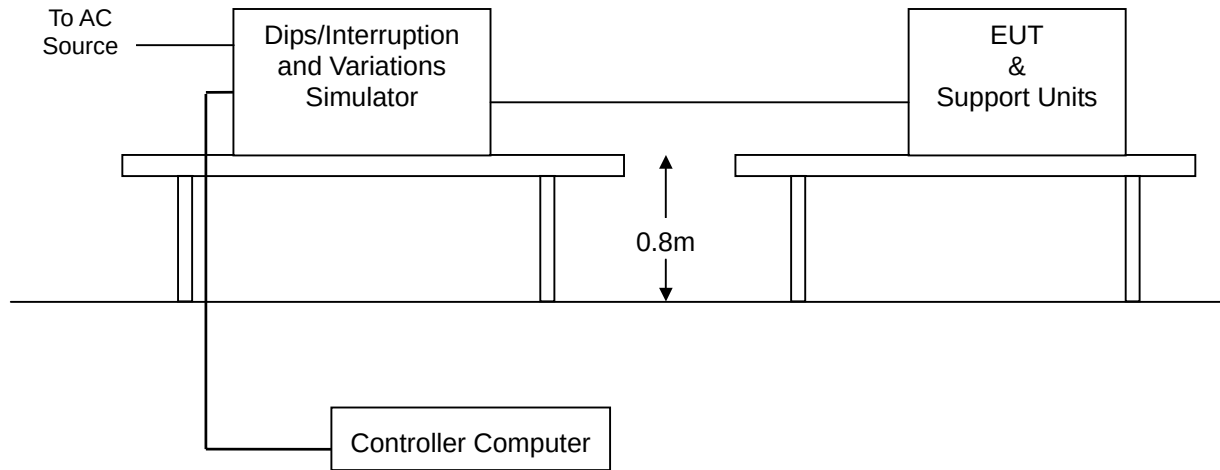
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R.= No Calibration Required.

8.9.3. TEST PROCEDURE

- The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
- Setting the parameter of tests and then perform the test software of test simulator.
- Conditions changes to occur at 0 degree crossover point of the voltage waveform.
- Recording the test result in test record form.

8.9.4. TEST SETUP



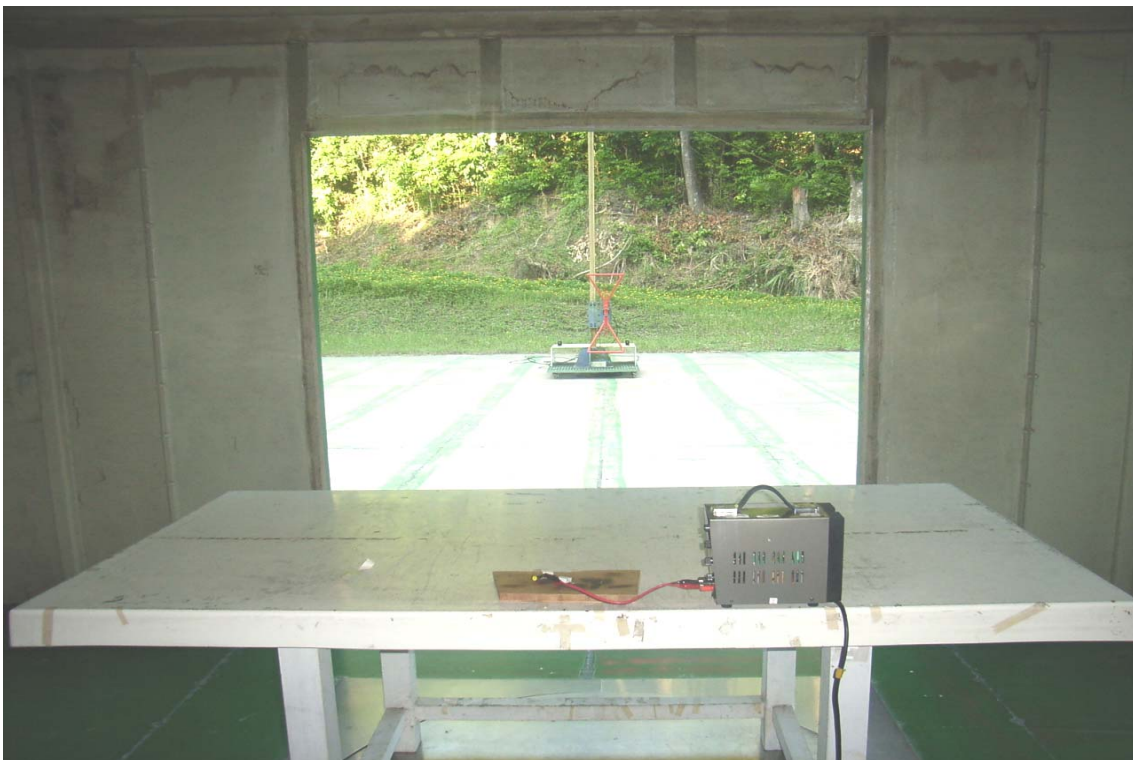
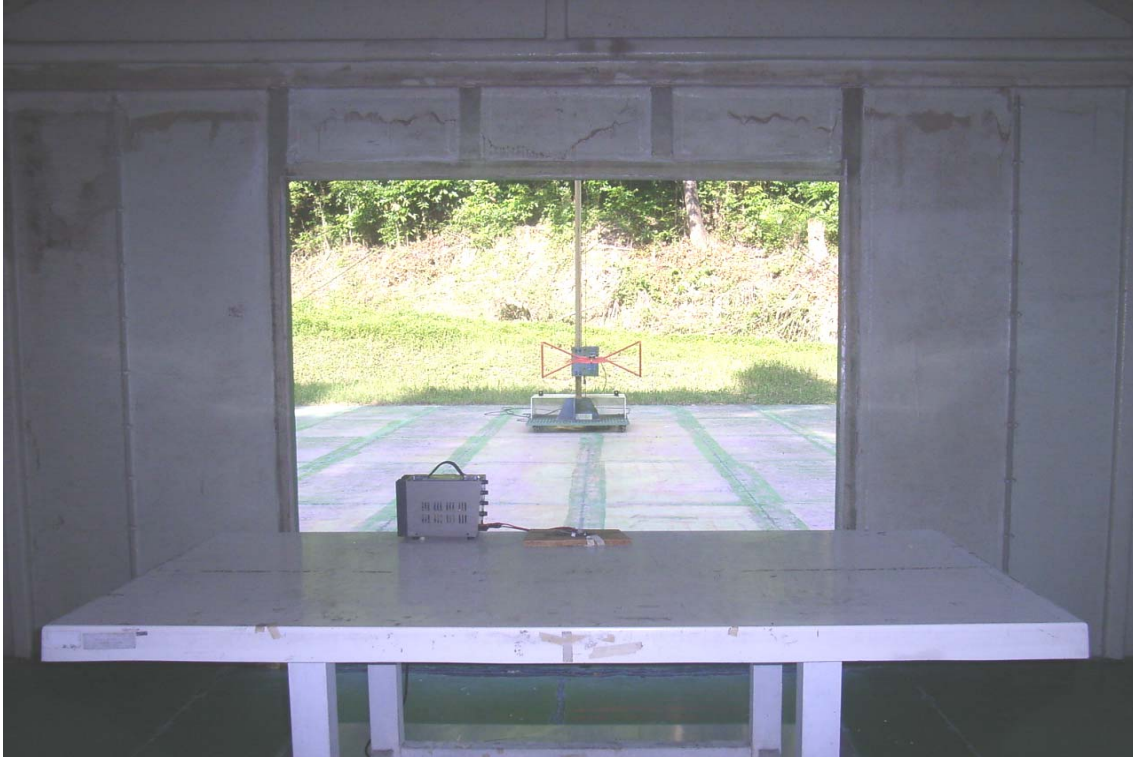
- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.9.5. TEST RESULTS

✘ This EUT has not connection to AC Source direct. No applicable for this test.

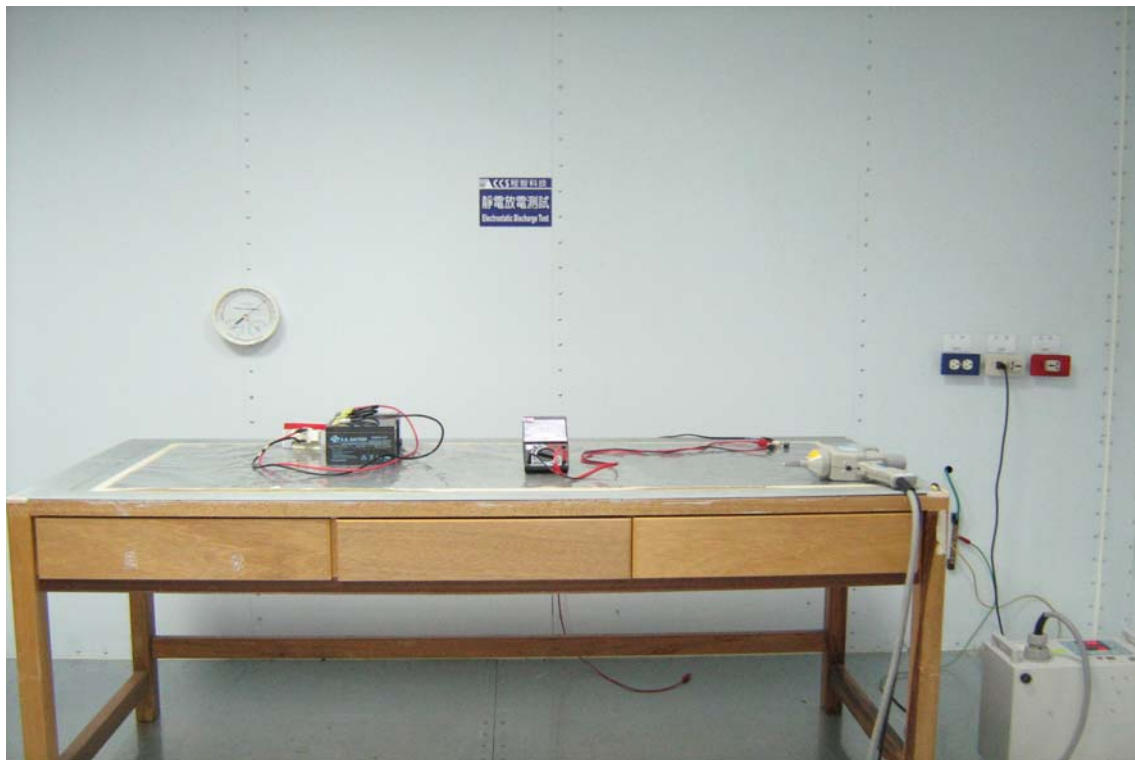
9 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST

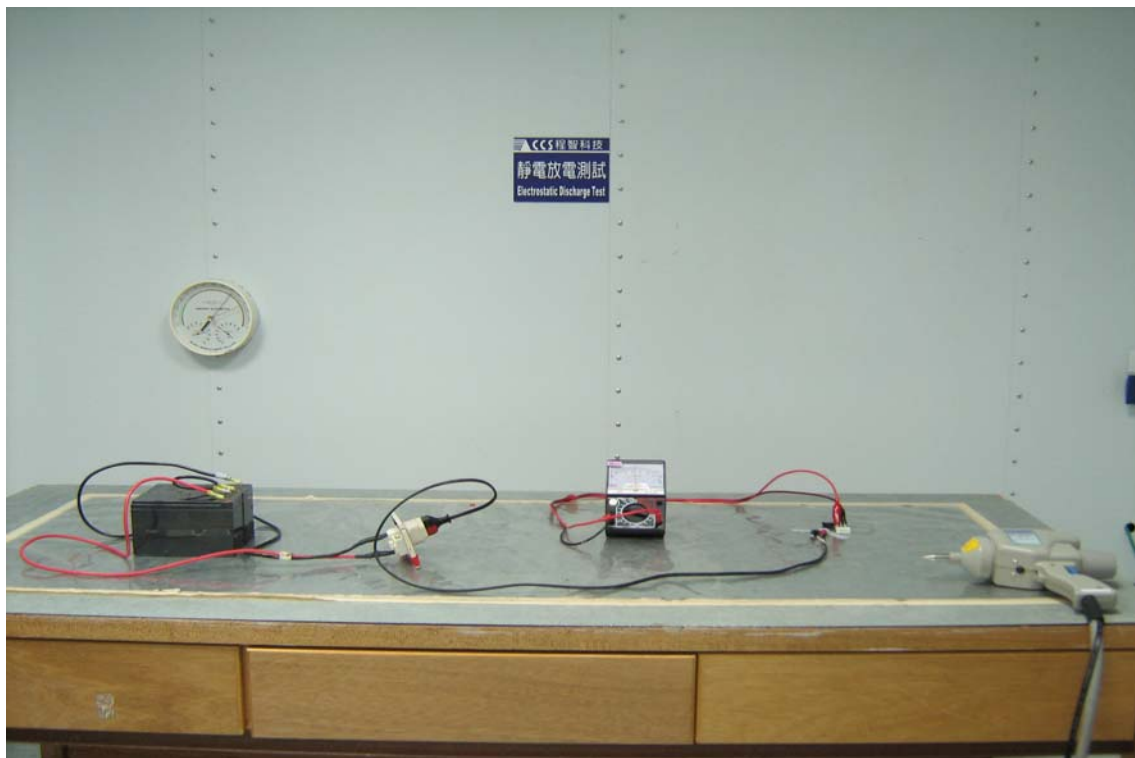


ESD TEST

For model: PBWS-4803.3



For model: PBWS-2405



RS TEST

For model: PBWS-4803.3



For model: PBWS-2405



EFT TEST

For model: PBWS-4803.3



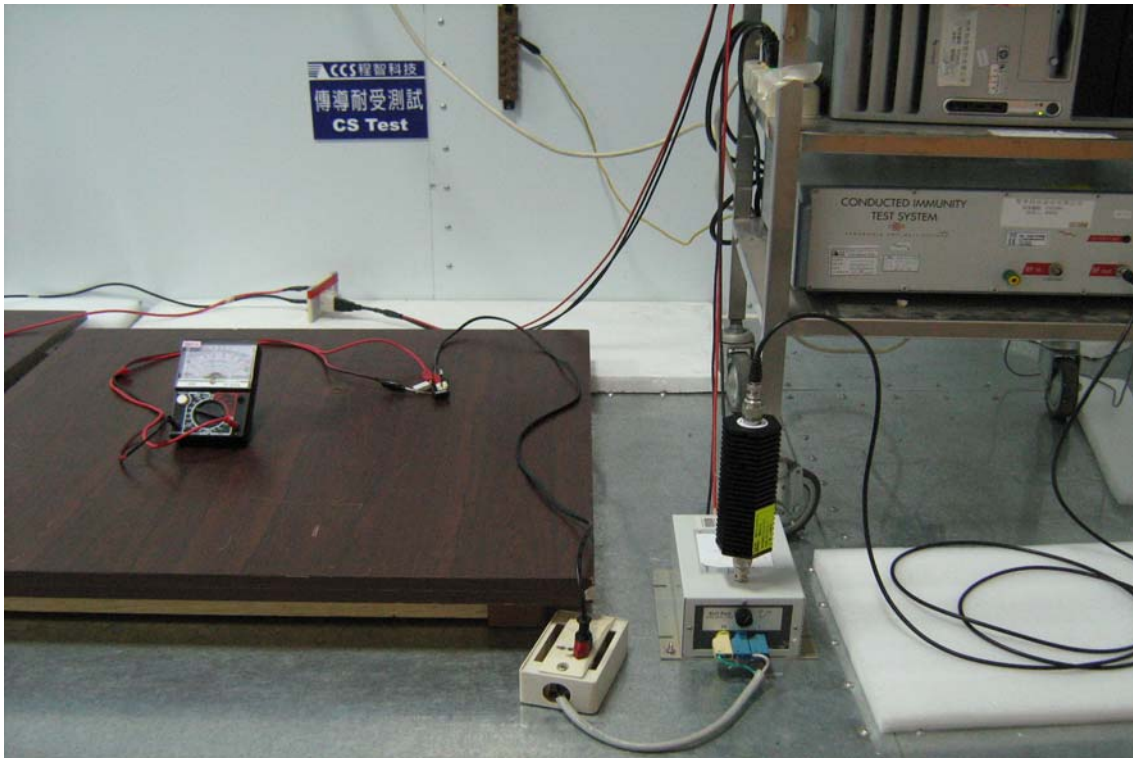
For model: PBWS-2405



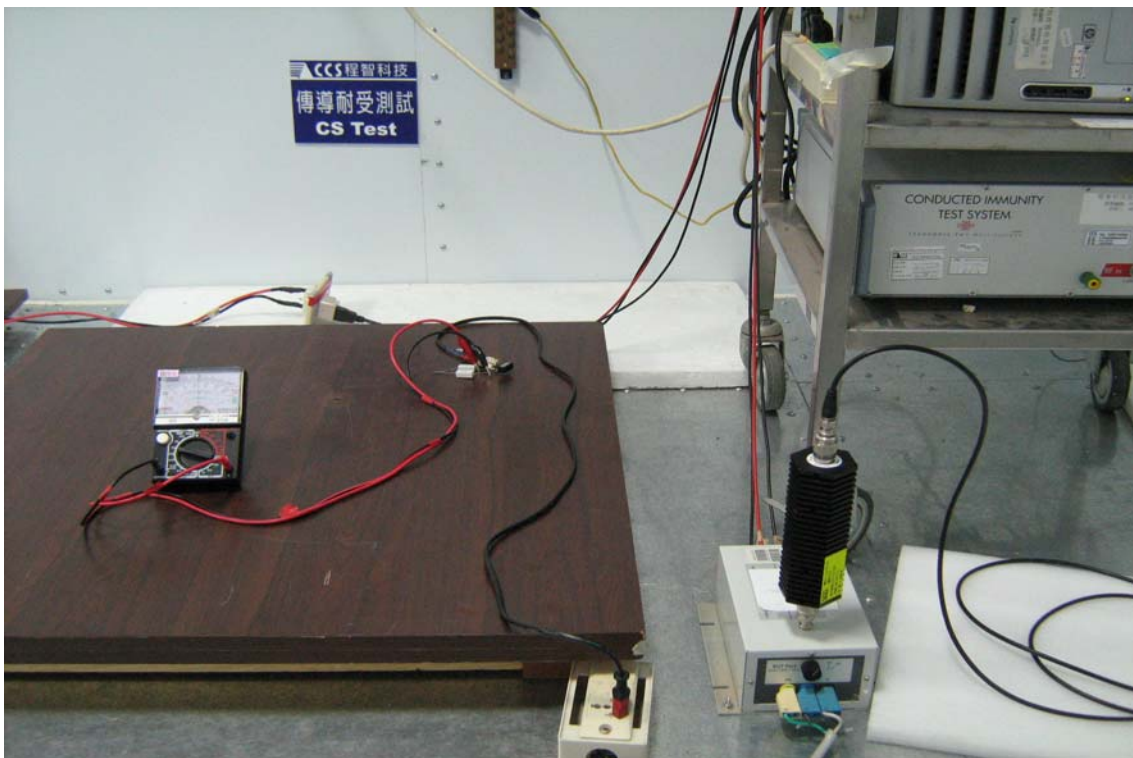
SURGE TEST**For model: PBWS-4803.3****For model: PBWS-2405**

CS TEST

For model: PBWS-4803.3

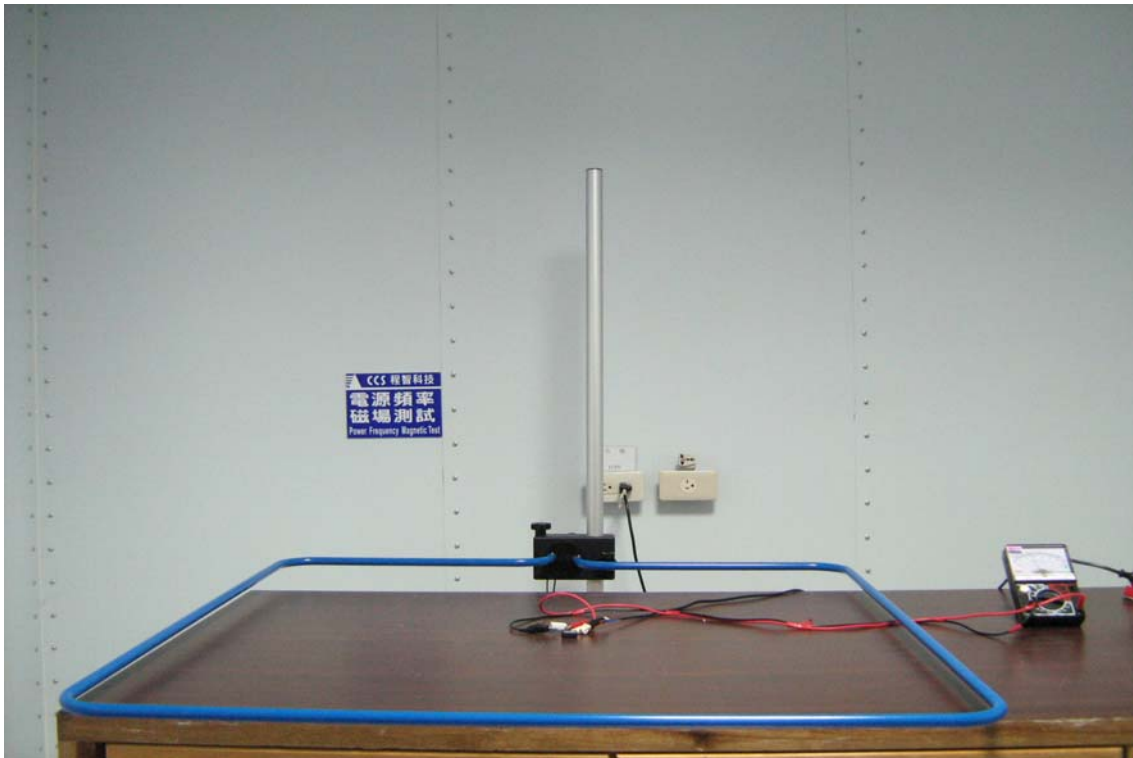


For model: PBWS-2405

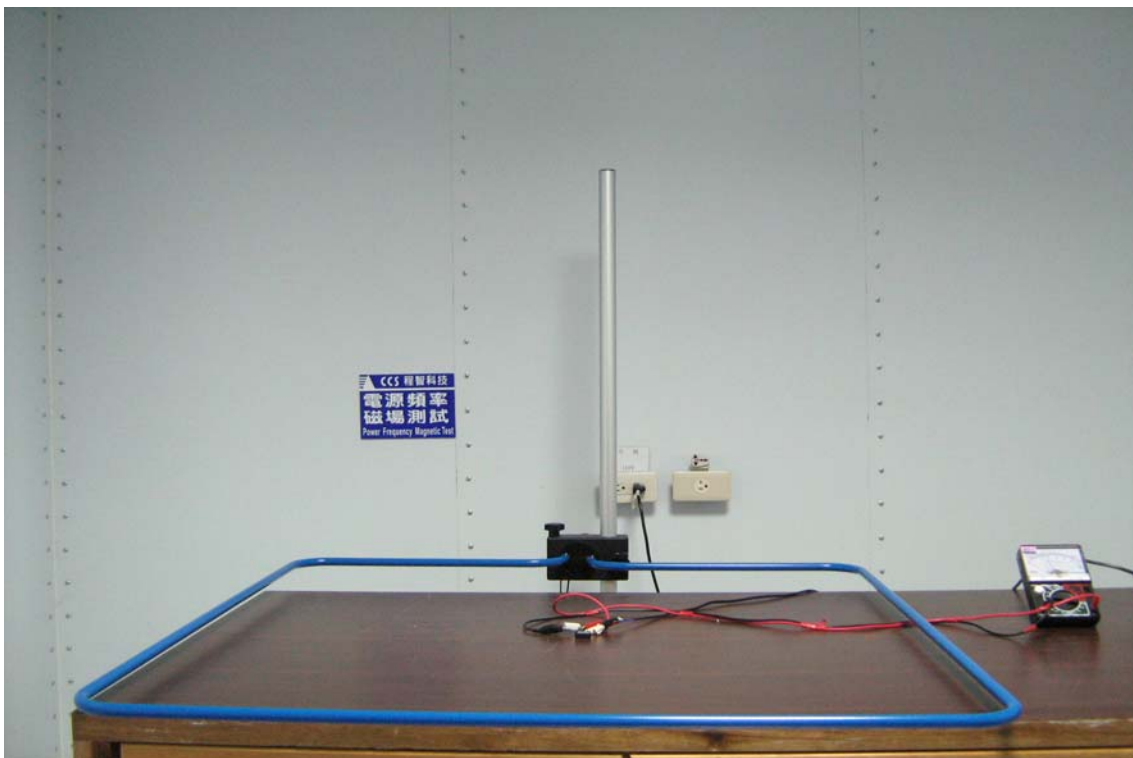


PFMF TEST

For model: PBWS-4803.3



For model: PBWS-2405



END OF REPORT